State of New Jersey
DEPARTMENT OF TREASURY
DIVISION OF PROPERTY MANAGEMENT & CONSTRUCTION
P O BOX 034
TRENTON NJ 08625-0034

PHILIP D. MURPHY
Governor

TAHESHA L. WAY
Lt. Governor

ELIZABETH MAHER MUOIO
State Treasurer

CHRISTOPHER CHIANESE
Director

February 22, 2024

Epic Management, Inc.
136 Eleventh Street
Piscataway, NJ 08854

Re: **Notice to Proceed**
Project #A1349-00
Interior Construction, Renovation and Upgrades – State Office Building
Trenton, NJ – Mercer County
Award Amount: **$16,272,000.**

To Whom It May Concern:

We have received and accepted your certificates of insurance and performance and payment bonds. Attached is a fully executed contract for your records.

Contract performance shall be completed within **351** calendar days of the date of this Notice to Proceed.

You have been authorized to proceed on **February 22, 2024** with **Non-Permit Activities.**

Sincerely,

Christopher R. Geary, Assistant Deputy Director
Contracts and Procurement

C B. Ogunnubi
V. Campanella
J. Langsdorf
E. Cardone
B. Mahan
S. Baker
M. Ryan
Central File
Treasury Fiscal

Receipt and Understanding is Hereby Acknowledged.

Signature

2/22/2024
Date

CONTRACT

THIS AGREEMENT, made this 22nd day of February, 2024

by and between The State of New Jersey, herein called "Owner," acting herein through its
(Corporate Name of Owner)

Division of Property Management and Construction, Deputy Director, , and
(Title of Authorized Official)

EPIC MANAGEMENT, INC.

(a corporation)

of **136 Eleventh Street,** City of **Piscataway,** County of **Middlesex,** and State of **New Jersey** hereinafter called "Contractor". (FID#22331752100)

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the **OWNER**, the **CONTRACTOR** hereby agrees with the **OWNER** to commence and complete the construction described as follows:

CONTRACT PROJECT NO.: **A1349-00-CC01**
INTERIOR CONSTRUCTION, RENOVATION AND UPGRADES
STATE OFFICE BUILDING, 135 WEST HANOVER STREET
MERCER COUNTY – TRENTON
NEW JERSEY

LUMP SUM BID ..... $16,272,000.

SPECIFICATIONS:	Dated 08-10-23 included as part of this contract
ALLOWANCES:	Submitted on Page 3 of 6 of the Bid Proposal Form, included as part of this contract
BULLETINS:	"A" dated 12-01-23, "B" dated 12-01-23, "C" dated 12-21-23 and"D" dated 01-29-24 have been acknowledged by the bidder and included as part of this contract
GEN.CONDITIONS:	Instructions to Bidders & General Conditions revised December 2015, included as part of this contract
DRAWINGS:	See cover sheet dated 08-10-23, included as part of this contract
POST BID REVIEW CERTIFICATION:	Dated 02-13-24, included as part of this contract

hereinafter called the project, for the sum of **SIXTEEN MILLION TWO HUNDRED SEVENTY TWO THOUSAND** Dollars (**$16,272,000.**) and all extra work in connection therewith, under the terms as stated in the General and Special Conditions, if applicable, of the Contract Specifications, and at his (its or their) own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendent, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal, the General Conditions, Special Conditions of the Contract Specifications, the plans, which include all maps, plats, blue prints, and other drawings and printed or written explanatory matter thereof, the specifications and contract documents therefore as prepared by **Lammey & Giorgio, PA,** herein entitled the Architect/Engineer, all of which are made a part hereof and collectively evidence and constitute the contract.

The contractor hereby agrees to commence work under this contract on **(See Notice to Proceed)** and to fully complete the project within **351** consecutive calendar days thereafter. Time is of the essence for the completion of this contract. The contractor further agrees to pay, as liquidated damages, the sum of **$8,136.00** for each consecutive calendar day thereafter as hereinafter provided in Article 7.5 of the General Conditions.

The **OWNER** agrees to pay the **CONTRACTOR** in current funds for the performance of the contract, subject to additions and deductions, as provided in the General Conditions of the Contract Specification, and to make payments on account thereof as provided in Article 10 of the General Conditions.

Only domestic materials shall be acquired or used for any public work unless the head of the department, or other public officer charged with the duty by law, shall determine it to be inconsistent with the public interest, or the cost to be unreasonable, or domestic materials of the class or kind to be used are not mined, produced or manufactured, as the case may be, in the United States in commercial quantities and of a satisfactory quality.

The Contractor shall conform to all provisions of "Law Against Discrimination" N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27.

IN WITNESS WHEREOF, the parties to these presents have executed this contract in four (4) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

ATTEST:

(Witness)

By

DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION

CHRISTOPHER R. GEARY
ASSISTANT DEPUTY DIRECTOR
(Title)

(Witness)

EPIC MANAGEMENT, INC.
(Contractor)

By

PRESIDENT
(Title)

136 ELEVENTH STREET
PISCATAWAY, NJ 08854
(Address)

DEBRA L DALRYMPLE
NOTARY PUBLIC
STATE OF NEW JERSEY
ID # 50120877
MY COMMISSION EXPIRES JAN. 31, 2025

WARRANTY:

It is hereby certified and warranted by the undersigned contractor and by the undersigned principals or officers thereof, for said Contractor and for themselves, personally and individually, that no person has been employed to solicit or secure this Contract in violation of the provisions of Section 10, Chapter 48 of the Laws of 1954, N.J.S.A. 52:34-15, or in violation of any other laws of the State of New Jersey; and it is further warranted that all applicable laws and regulations shall be complied within the performance of this contract.

Please be advised that pursuant to N.J.S.A. 54:49-19 et seq. and notwithstanding any provision of the law to the contrary, whenever any taxpayer, partnership or S corporation under contract to provide goods or services or construction projects to the State of New Jersey or its agencies or instrumentalities, including the legislative and judicial branches of State government, is entitled to payment for those goods or services at the same time the taxpayer, partner or shareholder of that entity is indebted for any State tax, the Director of the Division of Taxation shall seek to set off so much of that payment as shall be necessary to satisfy the indebtedness. The amount set-off shall not allow for the deduction of any expense or other deductions which might be attributable to the taxpayer, partner, or shareholder subject to set-off under this Act.

The Director of the Division of Taxation shall give notice of the set-off to the taxpayer, partner or shareholder and provide an opportunity for a hearing within 30 days of such notice under the procedures for protests established under N.J.S.A. 54:49-18. No request for conference, protest, or subsequent appeal to the Tax Court from any protest shall stay the collection of the indebtedness. Interest that may be payable by the State, pursuant to N.J.S.A. 52:32-32 *et. seq.* to the taxpayer shall be stayed.

By signing this contract, I certify, pursuant to N.J.S.A. 52:34-12.2, that the entity for which I am authorized to bid:

has no ongoing business activities in Northern Ireland and does not maintain a physical presence therein through the operation of offices, plants, factories, or similar facilities, either directly or indirectly, through intermediaries, subsidiaries or affiliated companies over which it maintains effective control; or

will take lawful steps in good faith to conduct any business operations it has in Northern Ireland in accordance with the McBride principles of nondiscrimination in employment as set forth in N.J.S.A. 52:18A-89.5 and in conformance with the United Kingdom's Fair Employment (Northern Ireland) Act of 1989, and permit independent monitoring of their compliance with those principles.

I certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements made by me are willfully false, I am subject to punishment.

(Witness)

DEBRA L DALRYMPLE
NOTARY PUBLIC
STATE OF NEW JERSEY
ID # 50120877
MY COMMISSION EXPIRES JAN. 31, 2025

By

EPIC MANAGEMENT, INC.
(Contractor)

PRESIDENT
(Title)

136 ELEVENTH STREET
PISCATAWAY, NJ 08854
(Address)

This contract conforms to the standard form approved by the Attorney General.

MATTHEW J. PLATKIN
ATTORNEY GENERAL OF NEW JERSEY

* Current Wage Rates dated **February 22, 2024** and are included as part of this contract.

PURSUANT TO NJSA 10:5-31 ET. SEQ AND NJAC 17:27-7.2, THE MINORITY PERCENTAGE GOAL REQUIREMENT FOR THIS CONTRACT IS **30%** PER SKILLED CRAFT.

PURSUANT TO NJSA 10:5-31 ET. SEQ AND NJAC 17:27-7.2, THE FEMALE PERCENTAGE GOAL REQUIREMENT FOR THIS CONTRACT IS **6.9%** PER SKILLED CRAFT.

"(The Contractor) shall maintain all documentation related to products, transactions or services under this contract for a period of five years from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller upon request."

****Revised per Bulletin D****

BID PROPOSAL FORM

STATE OF NEW JERSEY
DEPARTMENT OF TREASURY
DIVISION OF PROPERTY MANAGEMENT & CONSTRUCTION
P O BOX 034
TRENTON NEW JERSEY 08625-0034

The bid proposal is to be returned in the pre-addressed envelope and will be accepted no later than 2:00 p.m., **February 8, 2024** after which time the bid proposals will be publicly opened and read.

FIRM NAME:
(Please Type or Print)
(Business Street Address ONLY – No P O Box)

Epic Management, Inc.
136 Eleventh Street
Piscataway, NJ 08854

PROJECT NO **A1349-00**

PROJECT: Interior Construction, Renovation and Upgrades

LOCATION: State Office Building,
135 West Hanover Street,
Trenton, Mercer County, N.J.

COUNTY: Mercer

The undersigned Single Prime Contractor proposes to be responsible for all work shown in the contract plans and specifications.

☒ Single Bid lump sum all trades $ 16,272,000.00 (Numerical Figures Only)

In accordance with N.J.S.A. 52:35-1 et seq., the Contractor will be classified with the Division of Property Management and Construction (DPMC) in one of the following trades: **General Construction (C008) OR General Construction/Alterations and Additions (C009)**

The proposal is based upon the bid documents listed below.

1. Instructions to Bidders and General Conditions Revised December, 2015
2. Specifications dated August 10, 2023
3. Drawing(s)#: See drawing G001 for complete list dated August 10, 2023

This project will be fully completed and ready for occupancy within 351 calendar days.

Liquidated damages will be assessed at 1/20 of one percent (.05%) of the value of this contract (minimum of $250.00/day).

The above price is good through sixty (60) days after the bid opening date.

Submit only one bid proposal and bid bond form.

PROJECT NO.: A1349-00

A bid bond in the amount of fifty percent (50%) of the TOTAL bid, including alternates if applicable, must accompany this proposal form.

The Contractor must include prices for the base bid and all alternates and unit prices when requested, otherwise the bid may be considered non-responsive.

Having examined the bid documents and the site of the proposed work and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, the Contractor hereby proposes to furnish all labor, materials and supplies, and to construct the project as submitted, within the time set forth therein, and at the price stated. This price is to cover all expenses incurred in performing the work required, of which this proposal is a part.

The Contractor acknowledges and affirms that it has personal knowledge of or has obtained and reviewed a copy of the valid prevailing wage rates for all trades involved in the project for the geographical location of the project as issued by the Commissioner of the Department of Labor, P O Box 389,Trenton, New Jersey, 08625 (609) 292-2259.

The Contractor acknowledges receipt of the following Bulletins:

BULLETIN NUMBER	DATE OF BULLETIN
Bulletin A	December 1, 2023
Bulletin B	December 1, 2023
Bulletin C	December 21, 2023
Bulletin D	January 29, 2024

The names and addresses of each Subcontractor included in this Single Bid proposal are listed below and are classified with DPMC in accordance with N.J.S.A. 52:35-1 et seq. at the time of the bid due date. If the Single Prime contractor intends to perform the work described under any of the listed trades sections of this bid proposal form, that Single Prime Contractor must be classified in that trade and listed in the appropriate Subcontractor section of this bid proposal. The Contractor acknowledges the failure to list classified Subcontractors as part of Single Bid proposals shall constitute a non-waivable material deviation resulting in a rejection of the bid.

STRUCTURAL STEEL & ORNAMENTAL IRON (C029)

NAME: CAPITAL STEEL PRODUCTS, INC.

ADDRESS: 10 ESCHER ST, TRENTON, NJ 08609

PLUMBING (C030)

NAME: MCCLOSKEY MECH CONTRACTORS INC

ADDRESS: 445 LOWER LANDING RD., BLACKWOOD, NJ 08012

PROJECT NO.: A1349-00

HVACR (C032)

NAME: EPIC MECHANICAL, INC.

ADDRESS: 3320 ROUTE 66, NEPTUNE, NJ 07753

ELECTRICAL (C047)

NAME: DPI ELECTRIC & COMMUNICATIONS, INC.

ADDRESS: 12 CARDINAL WAY, FLEMINGTON, NJ 0882

ALLOWANCES

The following allowances have been included in this proposal.

	Description (Specification section) See Specification Section 012100	TRADE(S)	Amount
1.	Cleaning and preparing existing painted structural steel framing at canopy roof located along the west façade, removal of the existing metal roof panels and all associated flashings, procurement and installation of new standing seam metal roof panels, associated flashing, roof-edge drainage system (gutter and downspout) and extending stormwater piping from the bottom of the downspout to the adjacent lawn area.	C008 or C009	**$30,000**
2.	Cost to replace existing fire pump. Cost includes removal/disposal of existing pump, new pump with connections, testing, electrical connection, integration with Fire Alarm system.	C008 or C009	**$100,000**

EXECUTION OF CONTRACT

Upon receipt of written notice of the acceptance of this bid, the Contractor shall execute the formal contract within 10 calendar days and deliver a Performance and Payment Bond as well as other information as required in the bid solicitation.

COMMENCEMENT OF WORK

Contractor acknowledges that the work is to commence upon receipt of the Notice to Proceed with the exception of permit activities.

BID SECURITY

Bid Bond is fifty percent (50%) of the TOTAL bid, including alternates if applicable, and is to become the property of the State in the event the contract and bond are not executed within the time set forth as described in Section 6.4 of the Instructions to Bidders.

PROJECT NO.: A1349-00

CERTIFICATION

I certify that the below named firm is classified by the Division of Property Management and Construction in the approved amount of $ UNLIMITED for (trade) C006 -CONSTRUCTION MANAGER AS CONSTRUCTOR / C007 -DESIGN BUILD / ~~C008 -GENERAL CONSTRUCTION~~ until 3/15/2024 (expiration date).

I further certify that this firm's bid for this project does not cause the firm to exceed its aggregate rating limit, including consideration of uncompleted construction work (please refer to N.J.A.C. 17:19-2.13, which describes how certain major trade subcontract work is discounted 85% for purposes of calculating whether a contractor is within its rating).

Respectfully submitted.

(Seal-if Bid proposal is by a corporation)

By: Epic Management, Inc.
(Name of Firm)

(Signature)

President
(Title)

136 Eleventh Street
(Business Street Address ONLY – No P O Box)

Piscataway	New Jersey	Middlesex County	08854
(City	State	County	Zip)

Phone No. 732-752-6100

Fax No. 732-752-9200

Federal Identification No. [redacted]

Any change in ownership information since filing your Request for Classification (Form DPMC 27)

☐ Yes

☑ No

If yes, attach explanation.

PROJECT NO.: A1349-00

STATE OF NEW JERSEY
DEPARTMENT OF TREASURY
DIVISION OF PROPERTY MANAGEMENT & CONSTRUCTION

NON-COLLUSION AFFIDAVIT

PROJECT: **A1349-00 Interior Construction, Renovation and Upgrades**

State Office Building
135 West Hanover Street,
Trenton, Mercer County, N.J.

Bid Due Date **February 8, 2024** 02:00 PM

STATE OF NEW JERSEY |
| **SS.**
COUNTY OF | Middlesex

I, John Epifano of the City of The Township of Warren

in the County of Somerset and the State of New Jersey

of full age, being duly sworn according to law on my oath depose and say that:

I am President

of the firm of Epic Management, Inc.

the Contractor making the Bid Proposal for the above named project, and that I execute the said Bid Proposal with full authority so to do; that said Contractor has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named project; and that all statements contained in said bid proposal and in this affidavit are true and correct, and made with full knowledge that the State of New Jersey relies upon the truth of the statements contained in said Bid Proposal and in the statements contained in this affidavit in awarding the contract for the said project.

SIGNATURE OF PRINCIPAL

Subscribed and sworn to before me this 8th day

of Febuary 20 24

Notary Public

My Commission expires January 31, 2025.

DEBRA L DALRYMPLE
NOTARY PUBLIC
STATE OF NEW JERSEY
ID # 50120877
MY COMMISSION EXPIRES JAN. 31, 2025

EXHIBIT B

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
N.J.S.A. 10:5-31 et. seq. (P.L. 1975, C. 127)
N.J.A.C. 17:27-7.2

CONSTRUCTION CONTRACTS

During the performance of this contract, the contractor agrees as follows:

a. The contractor or subcontractor, where applicable will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following; employment, up-grading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

b. The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

c. The contractor or subcontractor will send to each labor union, with which he has a collective bargaining agreement a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

d. The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

e. When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. 17:27-7.2, provided however, that the Dept. of LWD, Construction EEO Monitoring Program may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures prescribed by the following provisions, A, B, and C, as long as the Dept. of LWD, Construction EEO Monitoring Program is satisfied that the contractor or subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the applicable employment goal established in accordance with N.J.A.C. 17:27-7.2. The contractor or subcontractor agrees that a good faith effort shall include compliance with the following procedures:

(A) If the contractor or subcontractor has a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the contractor or subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10.5-31 et seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the contractor or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly consistent with this chapter,

by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

(B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the contractor does not have a referral agreement or arrangement with a union for construction trade, the contractor or subcontractor agrees to take the following actions:

(1) To notify the public agency compliance officer, the Dept. of LWD, Construction EEO Monitoring Program, and minority and women referral organizations listed by the Division pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers;

(2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;

(3) Prior to commencement of work, to request the local construction trade union refer minority and women workers to fill job openings, provided the contractor or subcontractor has a referral agreement, or arrangement with a union for the construction trade;

(4) To leave standing requests for additional referral of minority and women workers with the local construction trade union, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade. The State Training and Employment Service and other approved referral sources in the area;

(5) If it is necessary to layoff some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and non-discrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;

(6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:

(i) The contractor or subcontractor shall interview the referred minority or women worker.

(ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards, in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the contractor or subcontractor shall hire minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.

(iii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Dept. of LWD, Construction EEO Monitoring Program, the contractor or subcontractors shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.

(iv) If, for any reason, said contractor or subcontractor determines that a minority individual or a women is not qualified or if the individual qualifies as an advanced trainee or apprentice, the contractor or subcontractor shall inform the individual in writing with the reasons for the determination and maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Dept. of LWD, Construction EEO Monitoring Program.

(7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, and on forms made available by the Dept. of LWD, Construction EEO Monitoring Program upon request.

(C) The contractor or subcontractor agrees that nothing contained in (B) above shall preclude the contractor or subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the contractor or subcontractor shall not be required to employ minority and women advanced trainees and trainees in numbers which result in the employment of advanced trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also the contractor or subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA-201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7. The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Division and to the public agency compliance officer.

The contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-the-job programs for outreach and training of minorities and women.

(D) The contractor and its subcontractors shall furnish such reports or other documents to the Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

ANTIDISCRIMATION PROVISIONS

Mandatory Language

N.J.S.A. 10:2-1

The contractor agrees that:

Antidiscrimination provisions. Every contract for or on behalf of the State or any country or municipality or other political subdivision of the State, or any agency of or authority created by any of the foregoing, for the construction, alteration or repair of any public building or public work or for the acquisition of materials, equipment, supplies or services shall contain provisions by which the contractor agrees that:

a. In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies, or services to be acquired under this contract, no contractor, nor any person acting on behalf of such contractor or subcontractor, shall, by reason of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex, discriminate against any person who is qualified and available to perform the work to which the employment relates;

b. No contractor, subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee engaged in the performance of work under this contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex;

c. There may be deducted from the amount payable to the contractor by the contracting public agency, under this contract, a penalty of $50.00 for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provisions of the contract; and

d. This contract may be canceled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the contract occurring after notice to the contractor from the contracting public agency of any prior violation of this section of the contract.

ADDITIONAL MANDATORY CONSTRUCTION CONTRACT LANGUAGE

It is the policy of the State of NJ Department of the Treasury, Division of Property Management & Construction (DPMC), that its contracts should create a workforce that reflects the diversity of the State of New Jersey. Therefore, contractors engaged by the DPMC, to perform under a construction contract shall put forth a good faith effort to engage in recruitment and employment practices that further the goal of fostering equal opportunities to minorities and women.

The contractor must demonstrate to the DPMC's satisfaction that a good faith effort was made to ensure that minorities and women have been afforded equal opportunity to gain employment under the DPMC's contract with the contractor. Payment may be withheld from a contractor's contract for failure to comply with these provisions.

Evidence of a "good faith effort" includes, but is not limited to:

1. The Contractor shall recruit prospective employees through the State Job bank website, managed by the Department of Labor and Workforce Development, available online at http://NJ.gov/JobCentralNJ;

2. The Contractor shall keep specific records of its efforts, including records of all individuals interviewed and hired, including the specific numbers of minorities and women;

3. The Contractor shall actively solicit and shall provide the DPMC with proof of solicitations for employment, including but not limited to advertisements in general circulation media, professional service publications and electronic media; and

4. The Contractor shall provide evidence of efforts described at 2 above to the DPMC no less frequently than once every 12 months.

5. The Contractor shall comply with the requirements set forth at N.J.A.C. 17:27.

AMERICANS WITH DISABILITIES ACTS
State Contract Language

Equal Opportunity for Individuals with Disabilities

The **CONTRACTORS** and the **STATE** do hereby agree that the provision of Title II of the Americans With Disabilities Act of 1990 (the "Act") (**42 U.S.C. S12101 et. seq.**), which prohibits discrimination on the basis of disability by public entities in all services, programs and activities provided or made available by public entities, and the rules and regulations promulgated pursuant thereunto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the **STATE** pursuant to this contract, the **CONTRACTOR** agrees that the performance shall be in strict compliance with the Act. In the event that the **CONTRACTOR**, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the **CONTRACTOR** shall defend the **STATE** in any action or administrative proceeding commenced pursuant to this Act. The **CONTRACTOR** shall indemnify, protect, and save harmless the **STATE**, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages of whatever kind or nature arising out of or claimed to arise out of the alleged violation. The **CONTRACTOR** shall, at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the **STATE**'s grievance procedure, the **CONTRACTOR** agrees to abide by any decision of the **STATE** which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the **STATE** or if the **STATE** incurs any expense to cure a violation of the **ADA** which has been brought pursuant to its grievance procedure, the **CONTRACTOR** shall satisfy and discharge the same at its own expense.

The **STATE** shall, as soon as practicable after a claim has been made against it, give written notice thereof to the **CONTRACTOR** along with full and complete particulars of the claim. If any action or administrative proceeding is brought against the **STATE** or any of its agents, servants, and employees, the **STATE** shall expeditiously forward or have forwarded to the **CONTRACTOR** every demand, complaint, notice, summons, pleading, or other process received by the **STATE** of its representatives.

It is expressly agreed and understood that any approval by the **STATE** of the services provided by the **CONTRACTOR** pursuant to this contract will not relieve the **CONTRACTOR** of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the **STATE** pursuant to this paragraph.

It is further agreed and understood that the **STATE** assumes no obligation to indemnify or save harmless the **CONTRACTOR**, its agents, servants, employees and subcontractors for any claim which may arise out of their performance of this Agreement. Furthermore, the **CONTRACTOR** expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the **CONTRACTOR**'s obligations assumed in this Agreement, nor shall they be construed to relieve the **CONTRACTOR** from any liability, nor preclude the **STATE** from taking any other actions available to it under any other provisions of the Agreement or otherwise at law.

ADVERTISEMENT FOR BIDS

Project No: **A1349-00 – Interior Construction, Renovation and Upgrades**
Location: **State Office Building – 135 West Hanover Street – Trenton, Mercer County, NJ**

A MANDATORY PRE-BID MEETING IS SCHEDULED FOR 10:00 A.M. JANUARY 9, 2024. LOCATION: MAIN ENTRANCE – STATE OFFICE BUILDING – 135 WEST HANOVER STREET – TRENTON, MERCER COUNTY, NJ. (GPS COORDINATES 40.22200, -74.76927) CONTACT PERSON: BABATUNDE OGUNNUBI VIA OFFICE (609) 633-7061 OR VIA CELL (609) 575-4972. ONLY BIDS SUBMITTED BY CONTRACTORS WHO ATTEND THIS MEETING WILL BE ACCEPTED.**

Sealed proposals must be received and time-stamped in the Plan Room, Division of Property Management & Construction, 33 West State Street, 9th Floor, (PO Box 034) Trenton, NJ 08625 until 2:00 p.m. on February 6, 2024 for:

Single Bid (lump sum all trades)
General Construction (C008) or
General Construction / Alterations & Additions (C009)
$17,818,570

IN ACCORDANCE WITH N.J.S.A. 52:32-2, THIS PROJECT SHALL BE BID AS A SINGLE BID (LUMP SUM ALL TRADES). BIDDER MUST BE CLASSIFIED THEMSELVES OR NAME THEIR CLASSIFIED SUBCONTRACTOR(S) FOR THE FOLLOWING TRADE(S):

Structural Steel & Ornamental Iron (C029)
Plumbing (C030)
HVACR (C032)
Electrical (C047)

Failure To List Classified Sub-Contractors Will Deem The Bid Non-Responsive.

A list of Classified Contractors / Sub-Contractors are available at the following Web site:
http://www.state.nj.us/treasury/dpmc/contract_search.shtml

This project is subject to a Project Labor Agreement (PLA).

Bid Documents may be examined at the DPMC Plan Room, 33 West State Street, 9th Floor, Trenton, NJ 08625 or obtained for a document fee based on the individual trade estimate shown above, as follows: For cost estimate under $100,000 – bid documents are free of charge. For cost estimate over $100,000 – a fee of $65 is required. An additional $25.00 fee is required for mailing of bid documents via United States Postal Service. **Shipping via Fedex is not available. Shipping via UPS is possible if the Contractor wishes to have the documents delivered by UPS.** If shipping via UPS, Bidder is responsible for paying delivery costs as calculated by UPS. For UPS overnight delivery, Bidder must provide a UPS account number. All fees are non-refundable and must be received by the Division before documents will be released. A company check payable to the "Treasurer, State of New Jersey" is required. Contact **Anthony Mangine at Anthony.Mangine@treas.nj.gov** for further information. Mailing address is as follows: Regular Mail (DPMC, P.O. Box 034, Trenton, NJ 08625) or Overnight Mail (DPMC, 33 West State St, 9th Fl, Trenton, NJ 08608).

Pursuant to N.J.A.C. 17:13, this project has been designated as a **Small Business Set-Aside Opportunity**.

Note: This contract includes a goal of awarding 25 percent of the total contract value to either a prime or subcontract level. The firm determined to be the lowest responsible bidder must produce copies of approval notice from the Division of Revenue and Enterprises Services designating the prime or subcontracting firm as a Small Business Enterprise prior to the **award of contract**.

All questions concerning the Small Business Set-Aside Program should be addressed to:

Division of Revenue and Enterprises Services
Small Business Enterprise
Department of the Treasury
33 West State Street, 5th Floor
P.O. Box 026
Trenton, NJ 08625-0026
Phone: 609-292-2146
www.state.nj.us/njbusiness/contracting

Bidders must be classified by the Division under N.J.S.A. 52:35-1 et seq and must submit bid security as provided in Instructions to Bidders and General Conditions, Revised December 2015. No bidder may withdraw his bid for 60 calendar days after the opening. The State may reject any and all bids in accordance with applicable law.

Bidders are required to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27.

Pursuant to Executive Order No. 166, signed by Governor Murphy on July 17, 2020, the Office of the State Comptroller ("OSC") is required to make all approved State contracts for the allocation and expenditure of COVID-19 Recovery Funds available to the public by posting such contracts on an appropriate State website. Such contracts will be posted on the New Jersey transparency website developed by the Governor's Disaster Recovery Office (GDRO Transparency Website).

The contract resulting from this [RFP/RFQ] is subject to the requirements of Executive Order No. 166. Accordingly, the OSC will post a copy of the contract, including the [RFP/RFQ], the winning bidder's proposal and other related contract documents for the above contract on the GDRO Transparency website.

CHRISTOPHER R. GEARY, ASSISTANT DEPUTY DIRECTOR
CONTRACTS & PROCUREMENT
DIVISION OF PROPERTY MANAGEMENT & CONSTRUCTION
STATE OF NEW JERSEY
DEPARTMENT OF THE TREASURY
P. O. BOX 034
TRENTON, NJ 08625-0034

MANDATORY PRE-BID MEETING

PROJECT #	**A1349-00 Interior Construction, Renovation and Upgrades**
LOCATION	State Office Building, 135 West Hanover Street, Trenton, Mercer County, N.J.
DATE	**January 9, 2024**
TIME	**10:00 A.M.**
CONTACT PERSON	**Babatunde Ogunnubi**
PHONE #	**Office #: 609-633-7061** **Cell #: 609-575-4972**
MEETING LOCATION	**Main Entrance** State Office Building, 135 West Hanover Street, Trenton, Mercer County, N.J. **(GPS Coordinates 40.22200, -74.76927)**

MUST ATTEND TO HAVE VALID BID

NOTE: It is each bidder's responsibility to determine the way to the location of the announced Pre-Bid meeting and to assure their timely arrival at the Conference. A maximum fifteen-minute grace period may be granted by the DPMC Project Manager, at his/her discretion, in case of extenuating circumstances determined prior to the scheduled start time. Bidders will be required to sign in at the beginning of the Conference. After the meeting has officially started, no other bidders will be permitted to sign-in. Failure to sign pre-bid sign in sheet will prohibit contractors bid from being accepted. Each bidder acknowledges and agrees they shall be responsible for all information discussed in pre-bid meeting.

PROJECT: **A1349-00 Interior Construction, Renovation and Upgrades**
LOCATION: **State Office Building,**
135 West Hanover Street,
Trenton, Mercer County, N.J.

ROAD DIRECTIONS TO State Office Building

Via I-295 & I-195 W

- Take NJ-29 N toward Trenton, Exit onto Calhoun St & Turn right onto Capitol St

DocuSign Envelope ID: 38065BE0-3000-4B1E-8622-F6452AA8FE49

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SPECIFICATIONS

INTERIOR CONSTRUCTION, RENOVATION AND UPGR
STATE OFFICE BUILDING
135 West Hanover Street, Trenton, Mercer County, NJ

A1349-00

STATE OF NEW JERSEY

Honorable Philip D. Murphy, Governor
Honorable Sheila Y. Oliver, Lieutenant Governor

DEPARTMENT OF THE TREASURY

Elizabeth Maher Muoio, State Treasurer

DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION
Christopher Chianese, Director

LAMMEY + GIORGIO

215 Highland Avenue, Suite B
Haddon Township, NJ 08108
p.856.833.0010

Mott MacDonald
Mechanical / Electrical / Plumbing / Fire Protection Engineers

O'Donnell & Naccarato
Structural Engineer

Vertical Transportation Excellence
Vertical Transportation Engineer

FINAL DESIGN SUBMISSION 3
10 AUGUST 2023

DS

STATE OF NEW JERSEY
STEPHEN A. GIORGIO
21054
LICENSED ARCHITECT
DocuSigned by:
Stephen Giorgio
378CFA33B14F44D...

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
building
Thomas Williams
Released: 11/29/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

INTERIOR CONSTRUCTION, RENOVATION AND UPGRAD
STATE OFFICE BUILDING
TRENTON, NJ 08618
DPMC NO: A1349-00
L+G NO: 21567

END OF TABLE OF CONTENTS

STATE OF NEW JERSEY

DEPARTMENT OF THE TREASURY

DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION

R E V I S E D

DECEMBER 2015

INSTRUCTIONS TO BIDDERS

AND

GENERAL CONDITIONS

TABLE OF CONTENTS

INSTRUCTIONS TO BIDDERS

IB 1 Bid Proposals

IB 1.1 Sealed proposals for the work described herein must be received and time-stamped in the Plan Room, Division of Property Management and Construction (DPMC), 9th Floor, 33 West State Street, P O Box 034, Trenton, NJ 08625-0034. The closing date and time for bids will be stated in the Advertisement for Bid. Bidders are cautioned that reliance on the US Postal Service or other mail delivery or courier service for timely delivery of proposals is at the bidders' risk. Failure by a bidder to have a sealed proposal reach DPMC by the prescribed time will result in rejection of the unopened submission.

IB 1.2 Bids may be accepted on the following branches of work, as applicable:

a. Lump Sum All Trades
b. General Construction
c. Structural Steel
d. Plumbing
e. Heating, Ventilating and Air Conditioning
f. Electrical
g. Special Categories as may be required

IB 1.3 Contractors classified by DPMC may obtain contract documents at the DPMC address above, or upon written request, subject to payment of applicable fees. Each bidder is herewith put on notice that its general classification by DPMC is not the sole basis for qualification for the award of work. The Director reserves the right to deny award to any bidder that is not clearly responsible, based upon experience, past performance, financial capability or other material factors, to perform the work required herein.

IB 1.4 The schedule of non-refundable bid fees below is based upon individual trade construction cost estimates. Upon request and at no cost the DPMC will furnish a set of the contract documents for review in the offices of the division at the address noted in paragraph IB1.1 above.

DPMC BID DOCUMENTS FEE SCHEDULE (PER PACKAGE):

TRADE ESTIMATE	DOCUMENT FEE	MAILING FEE
$100,000 or less	No charge	$25.00
Greater than $100,000	$ 65.00	$25.00

IB 1.5 Bid proposals based upon the plans, specifications, general, special and supplementary conditions and bulletins shall be deemed as having been made by the contractor with full knowledge of the conditions therein. Bidders are required to visit the site prior to submitting proposals for the work herein described, and to have thoroughly examined the conditions under which the contract is to be executed, including those reasonably observable conditions of the premises which would hinder, delay, or otherwise affect the performance of the contractor required under the terms of the contract. The State will not allow claims for additional costs as a result of the contractor's failure to become aware of the reasonably observable conditions affecting its required performance. The bidder is required to make appropriate allowances in the preparation of the bid for the

accommodation of such conditions. Bidders must warrant in the bid documents that the bidder is familiar with conditions existing at the site at the time the bid is submitted.

IB 1.6 Bid proposals shall be submitted on the standard form provided by DPMC, enclosed in a sealed envelope issued by DPMC. The name and address of the bidder must be indicated on the envelope, as well as indication of the DPMC project number, project location and other appropriate identification.

IB 1.7 All amounts in the bid documents shall be stated in numerical figures only.

IB 1.8 The bidder must include in the bid envelope: (1) the proposal signed by the bidder, (2) the executed affidavit of non-collusion, (3) the executed Source Disclosure Certification Form as further described in section IB1.11, (4) the executed Disclosure of Investment Activities in Iran Form and (5) bid security as further described in Section IB6.

IB 1.9 Proposals shall remain open for acceptance and may not be withdrawn for a period of 60 calendar days after the bid opening date.

IB 1.10 Proposals not submitted and filed in accordance with instructions contained herein and in the Advertisement for Bids may be rejected as non-responsive.

IB 1.11 Procurement Reform

a. RESTRICTIONS ON POLITICAL CONTRIBUTIONS – In accordance with N.J.S.A. 19:44A-20.13, *et seq.*, bidders submitting a bid on or after October 15, 2004, shall be required to submit a Certification and Disclosure Form and Ownership Disclosure Form for all Business Entities. These forms must be submitted by the bidder and approved prior to contract award.

   N.J.S.A. 19:44A-20.13, *et seq*, prohibits State departments, agencies and authorities from entering into a contract that exceeds $17,500 with an individual or entity that has made a contribution to that political party committee. N.J.S.A. 19:44A-20.13, *et seq,* further requires the disclosure of all contribution to any political organization organized under section 527 of the Internal Revenue Code that also meets the definition of "continuing political committee" within the meaning of N.J.S.A. 19:44A-3(n) and N.J.A.C. 19:25-1.7. The successful bidder shall also be required to adhere to all continuing obligations contained in N.J.S.A. 19:44A-20.13, *et seq*, regarding contributions and disclosures as required in N.J.S.A. 19:44A-20.13, *et seq*.

b. Source Disclosure Certification - Pursuant to N.J.S.A. 52:34-13.2, *et seq.*, all bidders submitting a proposal shall be required to complete a Source Disclosure Certification that all services will be performed in the United States. The bidder shall disclose the location by country where services under the contract will be performed and any subcontracted services will be performed. The Source Disclosure Certification will be attached to the bid proposal.

c. MacBride Principles - Pursuant to N.J.S.A. 52:34-12.2, a bidder must complete a certification on the DPMC form provided prior to contract award to attest, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates pursuant to N.J.S.A. 52:34-12.2, that the bidder has no ongoing business activities in Northern Ireland and does not maintain a physical

presence therein through the operation of offices, plants, factories, or similar facilities, either directly or indirectly, through intermediaries, subsidiaries or affiliated companies over which it maintains effective control; or will take lawful steps in good faith to conduct any business operations it has in Northern Ireland in accordance with the MacBride principles of nondiscrimination in employment as set forth in N.J.S.A. 52:18A-89.8 and in conformance with the United Kingdom's Fair Employment (Northern Ireland) Act of 1989, and permit independent monitoring of their compliance with those principles. If a contractor who would otherwise be awarded a contract or agreement does not complete the certification, then the Director may determine, in accordance with applicable law and rules, it is in the best interest of the State to award the contract or agreement to the next responsible bidder who has completed the certification. If the Director finds the contractor to be in violation of the principles which are the subject of this law, s/he shall take such action as may be appropriate and provided for by law, rule or contract, including, but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the contractor in default and seeking debarment or suspension of the contractor.

d. Investment Activities in Iran - Pursuant to N.J.S.A. 52, 32-55, *et seq.*, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete a certification with their bid on the DPMC form provided to attest, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of Treasury's Chapter 25 list as a person or entity engaging in investment activities in Iran. The Chapter 25 list is found on the Division of Purchase and Property's website at www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf. Bidders must review this list prior to completing the certification. Failure to complete the certification may render a bidder's proposal non-responsive. If the Director finds a person or entity to be in violation of law, s/he shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.

IB 2 **Bid Modification**

IB 2.1 A bidder may modify its bid proposal by electronic mail or letter at any time prior to the scheduled closing time for receipt of bids, provided such communication is received by the DPMC prior to such closing time. A mailed confirmation of any modification signed by the bidder must have been mailed and time-stamped by the US Postal Service prior to the specified closing time. Such confirmation, whether transmitted electronically or by mail, shall be accompanied by a newly executed affidavit of non-collusion.

IB 2.2 Communications shall not reveal the basic bid price but shall only provide the amount to be added, subtracted or modified so that the final prices or terms will not be revealed until the sealed proposal is opened. If written confirmation of the telegraphic modification is not received within two working days after the scheduled closing time, no consideration will be given to the telegraphic modification.

IB 2.3 Bids may be withdrawn upon receipt of a bidder's written request prior to the time fixed for the bid opening. A bidder's right to withdraw a bid is lost after a bid has been opened. If an error has been made in the bid amount, request for relief from the bid may be made in writing to the Director. The written request shall be signed by an authorized corporate officer. A determination of whether the bidder will be released shall be at the sole discretion of the Director, who shall issue a finding within five working days of receipt of all pertinent information relating to such request for relief.

IB 3 Consideration of Bids

IB 3.1 Award of Contracts or Rejection of Bids:

a. Contracts will be awarded to the lowest responsible bidder. The awards will be made, or the bids rejected, within 60 calendar days from the date of the opening of bids. At the discretion of the Director, a bid extension may be requested from the bidders if circumstances warrant an extension.

b. The Director reserves the right to award the contract on the basis of the single bid for the entire work, or on the basis of a separate bid and alternate, or any combination of separate bids and alternates, which the Director deems best serves the interest of the State.

c. The Director reserves the right to waive any bid requirements when such waiver is in the best interests of the State, and where such waiver is permitted by law. Such waiver shall be at the sole discretion of the Director.

d. The Director reserves the right to reject any and all bids when such rejection is in the best interests of the State. The Director also may reject the bid of any bidder which, in the Director's judgment, is not responsible or capable of performing the contract obligations based on financial capability, past performance, or experience. A bidder whose bid is so rejected may request a hearing before the Director by filing a written notice.

IB 3.2 The bidder to be awarded the contract shall execute and deliver the requisite contract documents, including payment and performance bonds, within the time specified. Upon the bidder's failure or refusal to comply in the manner and within the time specified, the Director may either award the contract to the next low responsible bidder or re-advertise for new proposals. In either case, the Director may hold the defaulting bidder and its surety liable for the difference between the applicable sums quoted by the defaulting bidder and the sum which the State may be obligated to pay to the contractor which is contracted to perform and complete the work of the defaulting bidder.

IB 4 Awards

IB 4.1 In executing a contract, the successful bidder agrees to perform the required work in a good and workmanlike manner to the reasonable satisfaction of the Director, and to complete all work within the number of calendar days specified in its contract.

IB 4.2 Successful bidders will be notified of the time and place for the signing of contracts. Key requirements in the contract, including, but not limited to, the number of days of performance of the contract, manner and schedule of payments, and other administrative details will be reviewed at the award meeting. The time and place of the first job meeting will be announced at the award meeting.

IB 4.3 The State reserves the right to award the contract upon the basis of a single bid for the entire work, or on the basis of separate bids for each prime trade when the total of the separate bids is less than the single bid. Alternates will be accepted or rejected in numerical sequence as cited in the bid documents and shall not be selected at random except as provided herein. Add alternates and deduct alternates will be specified separately. The State may choose from the add and deduct alternates without priority between the two groups so long as selection within each group is in numerical sequence from the first to the last. This limitation shall not apply, however, to any alternates concerning proprietary items. The Director, with the approval of the Using Agency, may accept alternates out of sequence, provided the Director states the reasons for so doing, in writing, within five working days following the opening of bids.

IB 4.4 Should submission of unit prices be required for specified items of work in bid proposals, they will be considered in the evaluation of bids as set forth in the bid proposal form.

IB 4.5 The successful bidder and all of its subcontractors are required to comply with the requirements of N.J.S.A. 10:5-31 et seq., regarding Equal Employment Opportunity in Public Works Contracts.

IB 5 Qualification of Bidders

IB 5.1 If the successful bidder is a corporation not organized under the laws of the State of New Jersey or is not authorized to do business in this State (foreign corporation), the award of the contract shall be conditioned upon the prompt filing by the said corporation of a certificate to do business in this State and complying with the laws of this State in that regard. This filing must be made with the Division of Revenue. No award of contract will be made until the Division of Revenue confirms this authorization.

IB 5.2 The State requires that each contractor, except in the case of a single contractor, shall perform a minimum of 35 percent of the contract work by the contractor's own forces. However, the Director has the sole discretion to reduce this percentage depending upon the nature and circumstances in any particular case, if the Director determines that to do so would be in the best interests of the State, and provided that the bidder submits a written request with the original bid proposal.

IB 5.3 The State reserves the right to reject a bidder at any time prior to the signing of a contract if information or data is obtained which, in the opinion of the Director, adversely affects the responsibility and/or the capability of the bidder to undertake and to complete the work, regardless of the bidder's previous qualification or classification. The State may

conduct any investigation as it deems necessary to determine the bidder's responsibility and capacity, and the bidder shall furnish all information and data for this purpose as requested by the State.

IB 5.4 Each bidder must be classified by DPMC in accordance with the provisions of the classification statute, NJSA 52:35-1, *et seq.*,. In the case of a single bid for all of the work, the bidder shall include in the bid the names of its principal subcontractors (in categories as listed in IB1.2 above), which must also be classified in accordance with the said statute.

IB 5.5 At the time of the bid due date, the bidder and the subcontractors must be registered in accordance with "The Public Works Contractor Registration Act", N.J.S.A. 34:11-56.48, *et seq.* All questions regarding registration shall be addressed to:

Contractor Registration Unit
New Jersey Department of Labor
Division of Wage & Hour Compliance
P O Box 389
Trenton NJ 08625-0389
Telephone: 609-292-9464
FAX: 609-633-8591

IB 5.6 In accordance with N.J.S.A. 52:32-44, *et seq.*Public Law 2001, Chapter 134, all contractors and subcontractors providing goods/services to State agencies and authorities are required to provide the contracting agency or authority with proof of registration with the Department of Treasury, Division of Revenue. The basic registration process involves the filing of Form NJ-Reg., which can be filed online at www.state.nj.us/njbgs/services.html or by calling (609) 292-7077 or (609) 292-1730.

IB 6 Deposit and Bid Bond

IB 6.1 The Proposal, when submitted, shall be accompanied by a Bid Bond satisfactory to the Director, for the sum of not less than fifty percent (50%) of the Total Bid including alternates, if applicable.

IB 6.2 The Bid Bond shall be properly filled out, signed, and witnessed.

IB 6.3 The Bid Bond shall be accompanied by a copy of the power of attorney executed by the surety company or companies. The power of attorney shall set forth the authority of the attorney-in-fact who has signed the bond on behalf of the surety company to bind the company and shall further certify that such power is in full force and effect as of the date of the bond.

IB 6.4 If the bidder whose proposal is accepted is unable to provide the performance and payment bonds or fails to execute a contract, then such bidder and the bid bond surety, where applicable, shall be obligated to pay to the State the difference between the amount of the bid and the amount which the State contracts to pay another party to perform the work. The bidder and the surety shall pay, upon demand, the entire amount of the State's difference in cost. Should there be a deficiency in excess of the bid deposit, the bidder shall make immediate payment to the State for any such deficiency. Nothing contained herein shall be construed as a waiver of any other legal remedies that the State may have against the contractor.

IB 6.5 Attorneys-in-fact who sign bid bonds or contract bonds must file a certified power-of-attorney with the State indicating the effective date of that power.

IB 7 Performance and Payment Bond

IB 7.1 The successful bidder shall furnish within ten (10) calendar days after notice of award both a performance bond in statutory form in an amount equal to one hundred percent (100%) of the total contract price as security for the faithful performance of this contract and a payment bond in statutory form in amount equal to one hundred percent (100%) of the contract price as security for the payment of all persons and firms performing labor and furnishing materials in connection with this contract. The performance bond and the payment bond may be combined or in separate instruments in accordance with law. If combined, they must be for 200% of the award amount. No contract shall be executed unless and until each bond is submitted to and approved by the State. The surety must be presently authorized to do business in the State of New Jersey. In addition to the other coverage provided, the Bond shall cover all Contract guarantees and any other guarantees/warranties issued by the Contractor.

IB 7.2 The cost of all performance and payment bonds shall be paid for by the successful bidder.

IB 7.3 If at any time the State, for justifiable cause, is dissatisfied with any surety which has issued or proposes to issue a performance or payment bond, the contractor shall, within ten calendar days after notice from the State to do so, substitute an acceptance bond (or bonds). The substituted bond(s) shall be in such form and sum and executed by such other surety or sureties as may be satisfactory to the State. The premiums on such bond(s) shall be paid by the contractor. No contract shall be executed and/or no payment made under a contract until the new surety or sureties shall have furnished such an acceptable bond to the State.

IB 7.4 Bonds must be legally effective as of the date the contract is signed. Each must indicate the contractor's name exactly as it appears on the contract. Current attorney-in-fact instruments and financial statement of the surety must be included with the bonds. Bonds must be executed by an authorized officer of the surety. Bonds furnished under this section shall conform in all respects to the requirement and language of NJSA 2A:44-143 to 147.

IB 8 Bulletins and Interpretations

IB 8.1 No interpretation of the meaning of the plans, specifications or other pre-bid documents will be provided to any bidder unless such interpretation is made in writing to all prospective bidders prior to the opening of bids. Any such interpretations must be identified in bid proposals submitted. Any interpretations which are not entered in accordance with this provision shall be unauthorized and not binding upon the State.

IB 8.2 Every request for an interpretation relating to clarification or correction of the plans, specifications, or other bid documents must be made in writing, addressed to the architect/engineer and the DPMC Director, and must be received at least five (5) working days prior to the date fixed for the opening of the bids. Any and all interpretations, clarifications or corrections and any supplemental instructions must be issued by the Director in the form of written bulletins and mailed by certified mail, return receipt requested, or by electronic notice to all prospective bidders not later than three (3) working days prior to the date of the opening of bids. All bulletins issued shall become part of the

contract documents and shall be acknowledged in all bid proposals. Failure of a bidder to acknowledge receipt of all such bulletins and interpretations by the time of bid opening shall result in its proposal being considered non-responsive, at the option of the Director.

IB 8.3 Each bidder shall be responsible for thoroughly reviewing the contract documents prior to the submission of bids. Bidders are advised that no claim for expenses incurred or damages sustained as a result of any error, discrepancy, omission, or conflict in the contract documents shall be recognized by the State unless, and only to the extent that, a written request for interpretation, clarification or correction has been submitted in compliance with Section IB8.2 and provided the matter has not been addressed by the State through the issuance of a bulletin interpreting, clarifying or correcting such error, discrepancy, omission or conflict.

IB 9 Assignments

IB 9.1 The contractor shall not assign all or any part of this contract without written consent of the State. Money due (or to become due) the contractor hereunder shall not be assigned for any purposes whatsoever.

IB 10 Federal Excise Taxes and State Sales Tax

IB 10.1 In general, bidders, in preparing bids, must take into consideration applicable Federal and State tax laws.

IB 10.2 Materials, supplies or services for exclusive use in erecting structures or buildings or otherwise improving, altering or repairing all State-owned property are exempt from the State sales tax. The successful bidder must submit Division of Taxation form ST13, Exempt Use Certificate, to the seller of all materials, supplies or services that will be incorporated into the Work.

IB 10.3 Bidders must determine the current status and applicability of any tax laws, and the contractor may make no claim based upon any error or misunderstanding as to the applicability of any tax laws.

IB 10.4 Purchases or rentals of equipment are not exempt from any tax under the State Sales Tax Act.

IB 11 Restrictive Specifications

IB 11.1 Should any bidder determine before the bid due date that any portion of the specifications or drawings specify a particular product which can be provided by only one supplier or manufacturer, with the result that competitive prices are not available, the bidder shall immediately notify the Director in writing of such fact.

IB 11.2 If such notice is not given in a timely manner, it shall be assumed that the bidder has included the estimate of such sole source in the bid. However, if the Director is notified in a timely manner of the sole source of supply or manufacture, the Director may order the product re-bid or take other lawful action. Such action shall be at the Director's sole discretion.

IB 12 Offer of Gratuities

IB 12.1 Bidders are advised that the laws of New Jersey (NJSA 52:34-19) make it a misdemeanor to offer, pay or give any fee, commission, compensation, gift or gratuity to any person employed by the State. Also, Executive Order #189 (1988) requires that all requests for proposals and contracts issued by the State specify prohibitions on vendor (contractor) activities, the violation of which shall render the vendor liable to ineligibility for State contracts, pursuant to the debarment procedures set forth in N.J.A.C. 17:19-4.1., *et seq*. These prohibited activities include the following:

a. No vendor shall pay, offer to pay, or agree to pay, either directly or indirectly, any fee, commission, compensation, gift, gratuity, or other thing of value of any kind to any State officer or employee or special State officer or employee, as defined by NJSA 52:34D-13b. and e., in the Department of Treasury or any other agency with which such vendor transacts or offers or proposes to transact business, or to any member of the immediate family, as defined by NJSA 52:13D-13i., of any such officer or employee, or any partnership, firm, or corporation with which they are employed or associated, or in which such officer or employee has an interest within the meaning of NJSA 52:13D-13g.

b. The solicitation of any fee, commission, compensation, gift, gratuity or other thing of value by any State officer or employee or special State officer or employee from any State vendor shall be reported in writing forthwith by the vendor to the Attorney General and the Executive Commission on Ethical Standards.

c. No vendor may, directly or indirectly, undertake any private business, commercial or entrepreneurial relationship with, whether or not pursuant to employment, contract or other agreement, express or implied, or sell any interest in such vendor to, any State officer or employee or special State officer or employee having any duties or responsibilities in connection with the purchase, acquisition or sale of any property or services by or to any State agency or any instrumentality thereof, or with any person, firm or entity with which he is employed or associated or in which he has an interest within the meaning of NJSA 52:13D-13g. Any relationships subject to this provision shall be reported in writing forthwith to the Executive Commission on Ethical Standards, which may grant a waiver of this restriction upon application of the State offer or employee or special State officer or employee upon a finding that the present or proposed relationship does not present the potential, actuality or appearance of a conflict of interest.

d. No vendor shall influence, or attempt to influence or cause to be influenced, any State officer or employee or special State officer or employee in his official capacity in any manner which might tend to impair the objectivity or independence of judgment of said officer or employee.

e. No vendor shall cause or influence, or attempt to cause or influence, any State officer or employee or special State officer or employee to use, or attempt to use, his official position to secure unwarranted privileges or advantages for the vendor or any other person.

f. The provisions cited above in paragraphs IB12.1.a. through e. shall not be construed to prohibit a State officer or employee or special State officer or employee from receiving gifts from or contracting with vendors under the same terms and conditions as are offered or made available to members of the general public subject to any guidelines the State Ethics Commission on Ethical Standards may promulgate under paragraph IB12.1.c. above.

END OF INSTRUCTIONS TO BIDDERS

GENERAL CONDITIONS

ARTICLE 1 - GENERAL PROVISIONS

1.1 DEFINITIONS:

1.1.1 Architect/Engineer: The Architect/Engineer ("A/E") is the consultant engaged by the DPMC to prepare the design and perform certain contract administration functions in accordance with the provisions of its contract with the DPMC.

1.1.2 Bulletin: A document, issued by DPMC prior to the opening of bids, which supplements, revises or modifies the bid document(s).

1.1.3 Change in the Work: A change in the Project and the Contract Documents, including, but not limited to, an increase or decrease in the Work, an acceleration or extension of time for the performance of the Work.

1.1.4 Change Order: A written order, directing or authorizing a Change in the Work executed by the DPMC and agreed to by the Contractor (except in the case of unilateral change orders executed by DPMC) that includes all adjustments to work, compensation and/or time warranted by the Change in the Work.

1.1.5 Code Official: the individual licensed by the NJ Department of Community Affairs authorized to enforce the NJ Uniform Construction Code (UCC) and approve or reject the Work for NJ UCC compliance.

1.1.6 Construction Management Firm or "CMF": A person or firm that may be engaged by the DPMC to assist DPMC in the administration of its contracts.

1.1.7 Contract: The entire and integrated agreement between the Contractor and the DPMC encompassing all of the Contract Documents.

1.1.8 Contract Documents: The executed form of Contract, General Conditions, Supplementary Conditions, Supplementary Instructions, Bulletins, plans, specifications, instructions to bidders, addenda, responses to requests for information, Price Proposal, Change Orders, other amendments, including construction change directives, and all exhibits, appendices and documents attached to or referenced in any of the foregoing materials.

1.1.9 Contract Limit Lines The lines shown on the Contract Drawings that define the boundaries of the Project, and beyond which no construction work or activities may be performed by the Contractor unless otherwise noted on the drawings or specifications.

1.1.10 Contractor: The business entity with whom the DPMC enters a contract for the performance of the construction of a construction Project by the terms set forth in the Contract Documents.

1.1.11 Contract Price: The sum stated in the Contract, as it may be adjusted in accordance with the Contract Documents, that represents the total amount payable by the DPMC to the Contractor for performance of the Work.

1.1.12 Day: A calendar day, unless otherwise designated.

1.1.13 Director: The person authorized by statute to administer the design, engineering and construction of all State buildings and facilities. The Director is the contracting officer representing the State personally or through authorized representatives in all relationships with Contractors, consultants and Architects/Engineers. This includes designees or an authorized administrative contracting officer acting within the limits of his or her authority. The Director or his or her duly authorized representative is the interpreter of the conditions of this contract and the judge of its performance.

1.1.14 Division of Property Management and Construction (DPMC): The State of New Jersey's contracting agency for the design and construction of State facilities.

1.1.15 Final Acceptance and Completion: The date following receipt and acceptance by DPMC of all administrative and close-out documents. Following acceptance, the DPMC will issue a Certificate of Final Acceptance and Completion for the Project.

1.1.16 Generally Accepted Accounting Principles: The common set of accounting principles, standards and procedures that companies use to compile their financial statements. Accounting records must identify all labor and material costs and expenses, whether they are direct or indirect. The identity must include at least the Project number for direct expenses and/or account number for indirect expenses.

1.1.17 NJUCC or Code: The New Jersey Uniform Construction Code which governs the permit and approval process for construction projects.

1.1.18 Notice: A written directive or communication given by DPMC to the Contractor to act or perform work or carry out some other contractual obligation, or a written communication to be served by the Contractor upon the State. A notice served on the Contractor will be deemed to have been duly served if delivered to an individual or member of the firm or entity or to an officer of the corporation for whom it was intended. This includes regular mail, e-mail, delivery by courier, or registered or certified mail, or facsimile to the Contractor's business address cited in the Contract documents. A notice from the Contractor to the State shall be deemed to have been duly served only if delivered to the Director or the Director’s duly authorized representative.

1.1.19 Notice to Proceed: The written communication issued by the DPMC to the Contractor directing the Contractor to begin the Work. The contract calendar day duration period will commence on the effective date noted.

1.1.20 Project: The term for the entire public works engagement. It includes the design, construction work and all administrative aspects required to fully complete the engagement.

1.1.21 Punch List: The list of incomplete or defective Work, compiled by DPMC and/or its authorized representative, which remains to be completed after achievement of Substantial Completion.

1.1.22 Schedule: The time tracking mechanism that establishes the Project’s allotted time requirements for completion as more specifically described in Article 6 of these General Conditions. When the construction activity items of the schedule have a monetary value associated with them, the schedule is referred to as a “costed” or “cost-loaded” schedule.

1.1.23 Site: The geographical location of the facility or property at which the Work under the Contract is to be performed.

1.1.24 State or Owner: The State of New Jersey, acting through DPMC.

1.1.25 Subcontractor: The business entity that enters into an agreement with the Contractor for the performance of work or materials under this Contract. Also refers to any agreement between a Subcontractor and any of lower tier Subcontractors. Such an agreement creates no relationship, legal or otherwise, between the DPMC and the Subcontractor(s) and/or lower tier Subcontractor(s).

1.1.26 Substantial Completion: The date when all essential requirements of the Contract Documents have been satisfied so that the purpose of the Contract Documents is accomplished, as determined by the DPMC including training of staff by the Contractor on all equipment, and resulting in the issuance of a temporary Certificate of Occupancy, a permanent Certificate of Occupancy or a permanent Certificate of Acceptance and when the Work and the facility can be safely occupied and used in accordance with its intended purpose. DPMC may condition issuance of a Certificate of Substantial Completion upon satisfactory receipt of critical documents.

1.1.27 Unit Schedule Breakdown: A detailed list of the Work activities required for Project construction, other elements associated with fulfilling the requirements of the Contract (bonds, insurance, etc.), major items of material, labor or equipment, and the prices associated with each of them.

1.2.28 Using Agency: The State department or agency for whom the construction project is being completed.

1.1.29 Work: All construction, supervision, labor, material and equipment necessary to complete the obligations under the Contract including Operation and Maintenance Manuals, Punch List completion, and As-Built Documents.

1.2 CONTRACT DOCUMENTS TO BE PROVIDED BY DPMC

Upon Contract award, the DPMC will furnish to the Contractor, free of charge, three copies of the drawings and specifications, and any additional instructions by means of supplemental contract documents as otherwise necessary for the proper execution of the Work, unless otherwise provided in the Contract Documents. Upon request, additional copies of the contract documents will be furnished at the Contractor's expense.

1.3 INTENT OF THE CONTRACT

1.3.1 The drawings, specifications and all of the Contract Documents are intended to require the Contractor to provide for everything necessary to accomplish the proper and complete finishing of all work. For the Project, the Contractor shall perform all of the obligations and work identified in the Contract Documents, regardless of the manner in which it is divided among the trades or the order in which it appears in the Contract Documents. All work and materials included in the specifications and not shown on the drawings, or shown on the drawings and not in the specifications shall be performed and/or furnished by the Contractor. The Contractor shall include any incidental materials

and/or Work not indicated in the drawings and/or the specifications which are nevertheless necessary for the development of the Project and are reasonably inferable from the contract documents and industry practice. The Contractor shall perform all such work and furnish all such materials as if particularly delineated or described in the contract documents as part of the bid proposal.

1.3.2 The Contractor acknowledges that in preparing its bid, the Contractor had the obligation to raise any reasonably observable errors, omissions, ambiguities or discrepancies and request an interpretation of the alleged errors, omissions, ambiguities or discrepancies. If the Contractor failed to do so, it will have waived all rights to a Change Order or claim and the Contractor will be responsible to complete the Work as required, consistent with the intent of the Contract Documents as interpreted by the DPMC, without additional compensation.

1.3.3 No interpretation of the meaning of the plans, specifications or other Contract Documents provided prior to bid submission shall be binding upon the State for any purpose unless issued in a Bulletin.

1.3.4 The Contractor shall abide by and comply with the intent and meaning of the Contract Documents taken as a whole, and shall not take advantage of any error or omission, should any exist. Should the Contractor become aware of the existence of any error, omission or discrepancy, the Contractor shall immediately notify the DPMC and the Architect/Engineer of any such errors, omissions, ambiguities or discrepancies and seek correction or interpretation thereof prior to commencement of the Work at issue. The Architect/Engineer shall issue a written interpretation. The Contractor shall do no work outside of the Contract Documents, unless written authorization to proceed from the DPMC is received by the Contractor.

1.3.5 Each and every provision required by law to be inserted in the Contract Documents is deemed to have been inserted therein. If any such provision has been omitted or has not been correctly inserted, then upon application of either party, the Contract may be modified to provide for such insertion or correction.

1.3.6 The order of precedence pertaining to interpretation of Contract Documents is as follows:

a. Executed Contract

b. Bulletins and Instructions

c. Supplemental General Conditions

d. Specifications and General Conditions

e. Drawings, in the following order of precedence:

(1) Notes on drawings

(2) Large scale details

(3) Figured dimensions

(4) Scaled dimensions

1.3.7 Where there may be a conflict in the Contract Documents not resolvable by application of the provisions of this Article, then the more expensive labor, materials, or equipment shall be assumed to be required and shall be provided by the Contractor.

1.3.8 On all work, it shall be the responsibility of the Contractor, by personal inspection of the existing building, facility, plant or utility systems, to ascertain the accuracy of any information given. This shall be the case, whether or not such information is indicated on the drawings, included in the specifications, or shown in any other documentation that is available. The Contractor shall have an affirmative duty to make reasonable inquiry for all available information. The Contractor shall include the costs of all material and labor required to complete the Work based on inspection and reasonably observable conditions.

1.4 WORKDAYS

Regular working hours will be defined in the Contract Documents. Changes thereto may be granted with written approval of the DPMC representative. Any work required to be performed after regular working hours or on Saturdays, Sundays, or legal holidays as specially set forth in the Contract documents, as may be reasonably required and consistent with contractual obligations, shall be performed at the amount set forth in the Contractor's bid without additional expense to the State. The Contractor shall obtain written approval of the DPMC representative for performance of work after regular working hours or on non-regular workdays at least forty-eight (48) hours prior to the commencement of overtime, unless such overtime work is caused by an emergency. If the Contractor seeks such approval for the overtime work, same shall be performed at no additional cost to the DPMC except in the event of an emergency, at which time, the DPMC, in its sole discretion, shall determine if the submitted overtime is compensable.

1.5 ASSIGNMENTS

The Contractor shall not assign all or any part of this Contract without the written consent of the Director. Money due (or to become due) the Contractor hereunder shall not be assigned for any purpose whatsoever without the written consent of the Director.

1.6 STATE SALES TAX

1.6.1 Materials, supplies or services for exclusive use in the construction of structures or buildings or otherwise improving, altering or repairing all State-owned property are exempt from the State sales tax.

1.6.2 Purchases or rentals of equipment are not exempt from any tax under the State Sales Tax Act.

ARTICLE 2 - OWNER/DPMC

2.1 DPMC'S REPRESENTATION

The DPMC will be represented on the Project by DPMC's designated representative(s). DPMC's designated representative(s) have only those duties that are required of the Owner under this Contract.

2.2 RIGHT TO PERFORM WORK

The DPMC may, and reserves the right to, enter upon the premises at any and all times during the progress of the Work, or cause others to do so, for the purpose of performing any work or installing any apparatus or carrying on any construction not included in the Contract Documents, or for any other reasonable purpose.

The DPMC shall have the right to defer the beginning of Work or to suspend the whole or any part of the Work whenever, in the sole discretion of the DPMC, it may be necessary or expedient for the State to do so.

2.3 MEANS AND METHODS

The State will not be responsible for, nor have control or charge of construction means, methods, techniques, sequences of procedures, or safety precautions and programs in connection with the Work. The State will not be responsible for, nor have control or charge of, the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other person performing any of the Work.

ARTICLE 3 - ARCHITECT/ENGINEER

3.1 DUTIES AND RESPONSIBILITIES

3.1.1 The Architect/Engineer ("A/E") is the consultant engaged by the DPMC to prepare the design and perform certain contract administration functions in accordance with the provisions of its contract with the DPMC.

3.2 PROGRESS MEETINGS

The Architect/Engineer will attend, chair and issue record minutes of bi-weekly job progress meetings.

3.3 SITE OBSERVATIONS

3.3.1 The Architect/Engineer will monitor the execution and progress of the Work. The Architect/Engineer will at all times be provided access to the Work. The Contractor shall provide facilities for such access so as to enable the Architect/Engineer to perform its functions.

3.3.2 The Architect/Engineer will not be responsible for, nor have control or charge of construction means, methods, techniques, sequences of procedures, or safety precautions and programs in connection with the Work. The Architect/Engineer will not be responsible for, nor have control or charge of, the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other person performing any of the Work.

3.4 SHOP DRAWINGS AND SUBMITTALS AND INVOICES

As more specifically described in Article 4, the Architect/Engineer will review, approve or take other appropriate action relating to Contractor's submittals, including shop drawings, product data and samples, and as – built drawings, to assure conformance with the requirements of the Contract. Such actions shall be taken with reasonable promptness. Approval of a specific item shall not indicate approval of an assembly of which the item is a component.

3.5 PAYMENT APPROVALS

3.5.1 The Architect/Engineer is responsible for the timely review of all invoices submitted by the Contractor. The Architect/Engineer shall inform the Contractor of any deficiencies therein. When the payment voucher is deemed accurate, the Architect/Engineer shall recommend approval of Contractor invoices.

3.5.2 The Architect/Engineer will review and recommend approval of Contractor closeout documentation in conjunction with the final application for payment.

ARTICLE 4 - THE CONTRACTOR

4.1 REVIEW OF THE CONTRACT DOCUMENTS AND FIELD CONDITIONS

4.1.1 The Contractor has the duty to thoroughly examine and be familiar with all of the Contract Documents and the Project site. The Contractor shall investigate and accurately determine the nature and location of the Work, the current building equipment and systems, labor and material conditions, and all matters which may in any way affect the Work or its performance.

4.1.2 The Contractor shall be deemed to have verified all reasonably observable conditions outside the Contract limit lines to determine whether any conflict exists with the Work that the Contractor is required to perform under the Contract. This includes but is not limited to a check on elevations, utility connections and other site data. If a condition changed from the time of the bid to the time of the issuance of the Notice to Proceed, the Contractor shall notify the Architect/Engineer immediately. The Contractor shall immediately report any conflicts prior to the bid proposal due date or waive any claim for additional compensation arising from such conflict.

4.1.3 During the progress of the Work, the Contractor shall immediately report in writing any alleged error, inconsistency, ambiguity or omission in the Contract Documents to DPMC. The Contractor shall not continue with any work that is affected by such alleged error, inconsistency, ambiguity or omission until the DPMC has had the opportunity to respond. Any error, inconsistency, ambiguity or omission shall be addressed pursuant to appropriate procedures set forth in these General Conditions.

4.1.4 Following notification of an alleged error, inconsistency, ambiguity or omission, the DPMC may issue supplemental instructions for the proper execution of the Work. The Contractor shall do no work without proper supplemental instructions. In giving such supplemental instructions, the DPMC will have the right to direct the Contractor to make minor changes in the Work without payment of additional monies. This provision is not intended to infringe upon or limit the DPMC's authority to otherwise direct changes in the Work, described elsewhere in these general conditions.

4.1.5 Where certain work is shown in complete detail, but not repeated in similar detail in other areas of the drawings, or if there is an indication of continuation with the remainder being shown only in outlines, the Work shown in detail shall be understood to be required in other like portions of the Project.

4.1.6 Unless otherwise directed in writing by the DPMC, the Contractor shall perform no portion of the Work without appropriate approvals as may be applicable and required by the Contract Documents.

4.1.7 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, equipment, materials, tools, construction equipment and machinery, water, heat, utilities, transportation and other facilities and services necessary for the proper execution, protection, and completion of the Work.

4.2 INSURANCE

The Contractor shall secure and maintain in force, for the term of the Contract, insurance coverage provided in Section 13.4. The Contractor shall provide the State of New Jersey with current certificates of insurance for all coverage and renewals thereof which must contain a provision that the insurance provided in the certificate shall not be canceled for any reason except after thirty (30) calendar day's written notice to the State of New Jersey. If cancellation occurs, the Contractor shall immediately procure new coverage, not allowing any lapse of coverage to occur.

4.3 PERMITS, LAWS, AND REGULATIONS

4.3.1 The DPMC shall obtain and pay for the construction permits and inspections (building, plumbing, electrical, elevator and fire), required by the Department of Community Affairs (DCA). When permits are issued by DCA, the appropriate licensed Contractors and/or Subcontractors shall be required to fill out the Contractor section of the Sub-Code Technical Section and sign and affix their raised seal thereto.

4.3.2 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for all other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work, and which are legally required at the time of receipt of bids.

4.3.3 All work must be done in accordance with the NJUCC. No work requiring inspections and approval by construction NJUCC code officials is to be covered or enclosed prior to inspection and approval by the appropriate NJUCC enforcement officials.

4.3.4 The Work performed pursuant to this Contract is exempt from local ordinances, codes and regulations as related to the building and the Site on which it is located, except in certain limited circumstances, where construction could adversely affect adjacent property, public sidewalks and/or streets. In those instances, the Contractor shall coordinate its activities with municipal and/or highway authorities having appropriate jurisdiction.

4.3.5 Immediately upon receipt of the contract award documents from the DPMC, the Contractor shall notify all utility companies involved regarding utility services required for completion of the Work. Such notification shall be in addition to any notification requirements imposed by law, including, without limitation, the Underground Facility Protection Act, N.J.S.A. 48:2-73, et seq.

4.3.6 The Contractor shall perform all soil conservation measures in accordance with County Soil Conservation District requirements.

4.3.7 The Contractor shall perform all sewage disposal work in conformance with the regulations of the State's Department of Environmental Protection.

4.3.8 The Contractor shall be responsible for obtaining timely NJUCC inspections of the Work from the applicable State agency. The Contractor shall request such

inspections through DPMC authorized representatives allowing for sufficient notice to enable NJUCC inspections to be scheduled without delay to the Work.

4.3.9 Consistent with section 4.4 of these General Conditions, the Contractor shall be responsible for its own actions and protect, defend and indemnify the State from all fines, penalties or loss incurred for, or by reason of, the violation of any municipal ordinance or regulation or law of the State while the said work is in progress.

4.3.10 The Contractor shall comply with the Federal Occupational Safety and Health Act of 1970 and all of the rules and regulations promulgated there under.

4.3.11 If the Contractor causes a substantial violation of a State, local or federal statute or regulation on the Project, DPMC may declare the Contractor to be in default, and/or terminate the Contract.

4.3.12 Prior to the start of any crane equipment operations, the Contractor shall make all necessary applications and obtain all required permits from the Federal Aviation Administration (F.A.A.). When the F.A.A. has jurisdiction, the sequence of operations, timing and methods of conducting the Work shall be approved by the F.A.A.

4.3.13 The Contractor will establish an approved Silica Health and Safety Program when tasks generating crystalline silica dust are being performed. This program shall include engineering, work practice, and respiratory protection controls to reduce worker exposure to airborne respirable crystalline dust to levels that are as low as reasonably achievable. When tasks are performed that generate airborne crystalline dust, the Contractor will minimize worker exposure to dust by one, or a combination of the following methods: 1) dust suppression with water, 2) local exhaust ventilation to a high-efficiency dust collector, and/or 3) appropriate respiratory protection devices. The Contractor shall provide a trained, competent person, as defined by OSHA 29 CFR 1926, on site at all times to implement the Silica Health and Safety Program when tasks generating crystalline silca dust are being performed.

4.4 RESPONSIBILITY FOR THE WORK

4.4.1 The Contractor shall be responsible to the State and to any separate Contractors and/or consultants including, without limitation, the Architect/Engineer, for the acts, errors and omissions of its employees, Subcontractors and their agents and employees that injure, damage or delay such other Contractors and/or consultants in the performance of their work.

4.4.2 The Contractor shall be responsible for all damage or destruction caused directly or indirectly by its operations to all parts of the Work, both temporary and permanent, and to all adjoining property.

4.4.3 The Contractor shall, at its own expense, protect all finished work and keep the same protected until the Project (or identifiable portions thereof, that are declared as substantially complete and being used) is completed and accepted.

4.4.4 The Contractor shall be responsible for safety and for any damage or injury which may result from the Contractor's failure or improper construction, maintenance or operation.

4.4.5 In order to protect the lives and health of its employees, the Contractor shall comply with all applicable statutes and regulations and pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc. and shall maintain accurate records of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work arising out of and in the course of employment on work under the Contract. If a conflict should exist with the requirements of the Federal Occupational Safety and Health Act of 1970, then the most stringent statute or pertinent provision shall apply.

4.5 INDEMNIFICATION

4.5.1 The Contractor shall assume all risk of and responsibility for, and agrees to protect, defend and indemnify the State of New Jersey, its agents, and its employees, from and against, any and all claims, demands, suits, actions, recoveries, judgment and costs of expenses in connection therewith on account of the loss of life, property, injury or damage to the person, body or property of any person or persons whatsoever, resulting from the Contractor's performance on the Project or through the use of any improper or defective machinery, implements or appliances, or through any act or omission on the part of the Contractor or its agents, employees or servants, which shall arise from or result directly or indirectly from the Work and/or materials supplied under this Contract. This indemnification obligation is not limited by, but is in addition to, the insurance obligations contained in this Contract.

4.5.2 In any and all claims against the State or any of its agents or employees, any employees of the Contractor or Subcontractor or anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation under this section shall not be limited in any way as to the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under worker's compensation acts, disability benefit acts, or other employee benefit acts.

4.6 SUPERVISION

4.6.1 The Contractor shall attentively supervise and direct the Work. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract.

4.6.2 The Contractor shall employ a full-time competent superintendent and necessary foremen and assistants, who shall be in attendance on the Project Site during the progress of the Work. The superintendent shall represent the Contractor, and all communications given to the superintendent shall be binding upon the Contractor. The State reserves the right to require a change in superintendent if the superintendent's performance, as judged by the DPMC, is deemed to be inadequate. Upon application in writing, and if deemed appropriate and expressly approved by the DPMC, the requirement for a full-time superintendent may be waived. If such a waiver is permitted, the Contractor shall employ a full-time competent foreman who shall be in attendance on the site during the progress of work and shall represent the Contractor, and all communications given to the foreman

shall be binding upon the Contractor. The Contractor shall not employ persons unfit or unskilled in the assigned area of work.

4.6.3 The Contractor shall ensure that its Subcontractors shall likewise have competent superintendents in charge of their respective portions of the Work at all times. Upon application in writing, and if deemed appropriate and expressly approved by the DPMC, the requirement for a full-time superintendent may be waived. If such a waiver is permitted, the Subcontractor shall employ a full-time competent foreman who shall be in attendance on the site during the progress of work and shall represent the subcontractor, and all communications given to the foreman shall be binding upon the subontractor. The Subcontractor shall not employ persons unfit or unskilled in the assigned area of work. If it becomes apparent that a Subcontractor does not have its portion of the Work under control of a competent foreman, the Contractor shall have the obligation to take appropriate steps to immediately provide proper supervision.

4.6.4 The Contractor shall employ qualified competent craftsmen in their respective lines of work. The State may require evidence that all employees have received sufficient training to execute the Work.

4.6.5 If, due to a trade agreement or project labor agreement, standby personnel are required to supervise equipment installation or for any other purpose during the normal working hours of other trades, the Contractor normally required to provide the standby services shall be deemed to have evaluated and included the costs thereof in its bid price and shall provide said services without additional charge.

4.6.6 The Contractor shall at all times enforce strict discipline and good order among its employees and shall not employ any unfit person or anyone not skilled in the task assigned.

4.7 SHOP DRAWINGS AND OTHER SUBMITTALS

4.7.1 The Contractor shall, within two weeks of the Notice to Proceed, submit to the Architect/Engineer, shop drawings and sample submission schedule for approval, which shall be used as a basis for complying with the overall progress schedule. The Contractor shall obtain, from its Subcontractor(s), all submittals including shop drawings, details, and schedules. The Contractor shall review the submittals for completeness and conformity with the Contract Documents, and shall stamp the submittals “approved”. The Contractor shall promptly forward two copies of each submittals in reproducible form to the Architect/Engineer, so as to cause no delay in its own work or that of any other contractor The DPMC Project number and the drawing and specification references shall be written or typed on all submissions. Failure to comply with these instructions will be sufficient reason to return the drawing to the Contractor without approval and any resulting delay in the Project shall be the sole responsibility of the Contractor.

4.7.2. The Architect/Engineer will review shop drawings and other submittals with reasonable promptness. The Contractor shall promptly make any corrections, if required by the Architect/Engineer, and resubmit a reproducible copy for approval. Within five (5) working days of final approval, the Contractor shall send the Architect/Engineer a

minimum of seven (7) prints of the finally approved shop drawings as well as seven (7) copies of all catalog cuts.

4.7.3 The Contractor shall prepare original shop drawings, and not simply copy the Contract Drawings for submission as shop drawings. All shop drawing sizes shall be in multiples of 9" x 12" (e.g., 18" x 24", 24" x 27", 24" x 36", etc.) as approved by the Architect/Engineer.

4.7.4 Any deviations or changes from the requirements of the Contract Documents, must be approved by the Architect/Engineer. A Contractor seeking approval for any deviations or changes must: a) make a written request for the proposed change; b) provide to the Architect/Engineer a detailed narrative description of the proposed change; c) highlight on the applicable drawing the proposed change; and d) furnish a detailed description of all potential impacts on the schedule and project budget.

4.7.5 Substitutions

4.7.5.1 Where any particular brand or manufactured article is specified, it shall be regarded as a standard. Similar products of other manufacturers, capable of equal performance and quality, may be accepted if approved by the Architect/Engineer and accepted by DPMC in writing.

4.7.5.2 In the event that a Contractor proposes a substitution to the specified equipment or materials, it shall be the Contractor's responsibility to submit proof of equality and to provide and pay for any tests which may be required by the DPMC in order to evaluate the proposal. If there is a substantial cost savings between the substitution and the specified equipment or material, the difference will be returned to the State in the form of a credit Change Order.

4.7.5.3 The application for the approval of a substitution must be submitted on the State form within 10 days of Notice to Proceed. Further, the submission shall include the following requirements:

a. A Full and complete identification information;

b. The identification of the paragraph and section of the specifications for which the substitution is proposed. The attachment of data indicating in detail whether and how the equipment or material differs, if at all, from the article specified;

d. A detailed explanation of any effect the proposed substitution will have on the scope of the Work and a certification that the Contractor agrees to be responsible for any and all resulting added costs to its Work and to any additional costs incurred by the Architect/Engineer in time, labor and/or redesign of the Contract Documents;

e. The submission of documents that demonstrate proof of equality, along with an agreement to have such tests performed at the Contractor's own expense as may be required for approval by the DPMC and/or the Architect/Engineer. The Contractor shall be responsible for the cost of reviews by the Architect/Engineer of subsequent submissions of additional information.

4.7.5.4 No Contractor shall base a bid on a substitution that may have been approved on previous Projects. Bids shall be based solely on plans and specifications of this Project.

4.7.5.5 The Contractor shall not proceed with the purchase or installation of a substitution without the written approval of DPMC. Any such installation may result in the assessment of costs for its removal at the Contractor's expense, and/or other damages and/or termination of the Contract for default.

4.7.6 Additional Submissions

4.7.6.1 Samples: The Contractor shall furnish, for approval, all required samples. Such samples shall be submitted in accordance with the shop drawing and sample submittal schedule. All work must be installed in accordance with approved samples.

4.7.6.2 Utility Service Connections: With respect to plumbing, fire-protection, HVAC, electrical and other machinery and mechanical equipment items requiring utility service connections, the Contractor must submit the respective shop drawings with the manufacturer's certified rough-in drawings, indicating accurate locations and sizes of all service utility connections.

4.7.6.3 Sleeve and Opening Drawings: Prior to installing service utilities or other piping, through structural elements of the building, the Contractor shall prepare and submit, for approval by the Architect/Engineer, accurate dimensional drawings indicating the positions and sizes of all sleeves and openings required to accommodate the Work and installation of the Contractor's piping, equipment, etc. All such drawings must contain reference to the established dimensional grid of the building. Such drawings must be submitted in accordance with the approved shop drawing and sample submission schedule.

4.7.6.4 Control Valve and Circuit Location Charts and Diagrams: For all plumbing, fire-protection, HVAC and electrical work, the Contractor shall prepare a complete set of inked or typewritten control valve and circuit location diagrams, charts and lists identifying and locating all such items, and shall place the charts, diagrams and lists under frame glass in designated equipment rooms. The Contractor shall also furnish one-line diagrams, as well as such color-coding of piping, wiring and other necessary identifications as specified or required. This information is to be framed under glass and displayed where directed.

4.7.6.5 Coordination Drawings: The Contractor shall create and update a complete, composite set of Coordination Drawings. The purpose of these drawings is to identify coordination and interference problems prior to installation. Coordination Drawings are required for all equipment rooms, above ceiling spaces, shared chases, and other areas where the Work of two or more trades is to be installed. The drawings shall be drawn to a scale not smaller than 1/4"=1'-0" (30"x42" sheet size) and shall show clearly in both plan and elevation that all Work can be installed without interference. At a minimum these drawings shall indicate:

a. The interrelationship of equipment and systems;

b. Required installation sequences;

c. Equipment foundations and pads, equipment, piping, conduits, racks, ductwork, insulation, panels, control centers, sprinkler and fire protection systems etc. and required clearances.

The Contractor shall prepare the coordination drawings based on the submitted shop drawings and Contract Documents. The Contractor shall prepare, submit and receive approvals for the Coordination Drawings before any sleeves or inserts are set, any floor openings are core drilled, or any equipment, equipment foundations, or related work is installed. The cost of preparing approved Coordination Drawings shall be included in the Contractor's price. DPMC may require the Contractor to identify Coordination Drawings as an item within the Schedule of Values, and incorporate them into in the Project schedule.

4.8 AS-BUILT DRAWINGS

4.8.1 The Contractor and each Subcontractor shall maintain on the Project Site at all times one set of drawings to be marked "AS-BUILT." The DPMC has the right to rely on accuracy of the "as-built" drawings provided by the Contractor. During the course of the Project, the Contractor shall mark these drawings with colored pencils to reflect any changes, as well as the dimension and the location of all pipe runs, conduits, traps, sprinkler and fire protection lines, footing depths or any other information not already shown on the drawings or differing therefrom. All buried utilities outside the building shall be located by a survey performed by a licensed surveyor who shall certify as to its accuracy. These marked-up drawings and surveys shall remain current and shall be made available to the DPMC or Architect/Engineer at all times during the progress of the Work.

4.8.2 In instances where shop drawings and/or erection drawings, of a scale larger than the Contract Drawings, are prepared by the Contractor, such drawings may be acceptable "as-built" drawings provided they are updated. A master sheet of the same dimensions as the Contract Drawings shall be prepared by the Contractor that shall indicate, sheet by sheet, a cross-reference to all shop drawings pertaining to that drawing.

4.8.3 The Contractor shall submit the "as-built" documents to the Architect/Engineer with a certification as to the accuracy of the information thereon at the time of Contract completion and before final payment will be made to the Contractor. After acceptance by the Architect/Engineer, the Contractor will furnish two sets of all shop drawings used for "as-built" documentation.

4.8.4 All "as-built" drawings as submitted by Contractors shall be dated and labeled "AS-BUILT" above the title block. This information shall be checked, edited and certified by the Architect/Engineer, who will then transpose such information from the Contractor's "as-built" drawings to the original drawings. Where shop drawings have been used by the Contractor for "as-built" documentation, the master sheet providing cross reference information, as described in section 4.8.2, shall be included in the set of "as-built" drawings furnished to DPMC.

4.9 EXCAVATIONS, CUTTING AND PATCHING

4.9.1 Soil borings, test pits or other subsurface information may be secured by an independent Contractor retained by the State prior to design and construction of the Project and, if obtained, may be included in the Contract Documents for the Contractor's use. The Contractor assumes full responsibility for interpretation of said information.

4.9.2 The Contractor shall be responsible for furnishing and setting of sleeves, built-in items, anchors, inserts, and other necessary materials for its work and for all cutting, fitting, closing in, patching, finishing, or adjusting of its work in new and/or existing construction, as required for the completed installation.

4.9.3 Approval in writing from the DPMC and the Architect/Engineer must first be obtained by the Contractor before cutting or boring through any roof, floor beams, floor construction or structural members.

4.10 TESTING

4.10.1 The Contractor shall notify the DPMC in writing of all work required to be inspected or tested. The notice shall be provided no later than five working days prior to the scheduled inspection or test. The Contractor shall bear all costs of such inspections or tests, except for Code inspections as stated in section 4.3 of this document.

4.10.2 When mechanical, electrical or other equipment is installed, it shall be the responsibility of the installing Contractor to maintain, warrant and operate it for such period of time as required by the Contract Documents or as necessary for the proper inspection and testing of the equipment and for adequately instructing the State's operating personnel. All costs associated with the maintenance, warranty, operations, inspection and testing of equipment, as well as instructing State personnel, shall be borne by the Contractor installing the equipment. All tests shall be conducted in the presence of, and upon timely notice to, the DPMC, prior to acceptance of the equipment.

4.10.3 DPMC shall have the authority to direct in writing that special or additional inspections or tests be performed. The Contractor shall comply and give notice as detailed above.

4.10.4 In the event such special or additional inspections or testing reveal a failure of the Work to comply with the terms and conditions of the Contract, the Contractor shall bear all costs thereof, including all costs incurred by the State made necessary by such failures.

4.10.5 The Contractor shall utilize inspection or testing from those firms/entities pre-qualified by DPMC. Failure to use a firm/entity pre-qualified by DPMC shall be grounds for rejection of the inspection or test as non-conforming.

4.10.6 All submittals of inspections, test reports or requests for approval shall be accompanied by a certification signed by the Contractor, attesting to: the Contractor's knowledge of the submittal; acceptance of its findings; acknowledgment that material testing meets the required standards; and a certification of the report's representation of

the facts. Failure to provide the written certification shall be grounds for rejection of the submittal.

4.10.7 The Contractor shall ensure that a copy of the inspection report is transmitted directly to the Architect/Engineer and the DPMC. The Contractor shall ensure that it includes in all of its subcontracts and purchase orders for inspection and testing, the requirement for the inspection or testing firm/entity to submit a copy of the report directly to the DPMC representative. The Contractor shall ensure that all such reports are submitted within fourteen (14) calendar days of the test or inspection.

4.10.8 In addition to tests performed by the Contractor, the State reserves the right to engage an independent testing agency or firm to perform testing inspections. The Contractor shall provide full access, provide samples, and cooperate fully with this testing agency.

4.10.9 Testing requirements for real property installed equipment (RPIE) to be furnished by the Contractor, when such testing is required by Code, Contract, or the manufacturer, shall be performed by a testing laboratory pre-qualified by DPMC, or in the absence of such, by the manufacturer or its authorized representative. The Contractor shall provide five working days' notice to the DPMC representative, to allow sufficient opportunity to witness the test.

4.10.10 The DPMC may order that any part of the Work be re-examined by the DPMC, and if so ordered, the Contractor shall open or uncover such work for re-inspection by the DPMC. If such work is found to be in accordance with the Contract, the DPMC shall pay the cost of re-inspection; however, if such work is not found to be in accordance with the Contract, the Contractor shall be responsible for the cost of re-inspection and replacement of any defective or non-conforming work.

4.11 EQUIPMENT AND MATERIALS

4.11.1 The Contractor warrants that all materials and equipment furnished under the Contract will be new, unless otherwise specified, and that all work will be of good quality, free from faults, defects, and installed in conformance with the Contract Documents. All work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective and rejected by the DPMC or the Architect/Engineer. If required by the Architect/Engineer or the DPMC, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty shall be in addition to but not in lieu of any other warranty or guarantee provided for in the Contract.

4.11.2 The Contractor shall submit to the Architect/Engineer an original and six copies of the request for approval of materials on the form provided by DPMC for approval. Each item of material listed shall be marked "As Specified", "Substitution" or "Unspecified" as appropriate.

4.11.3 The Contractor shall furnish and deliver the necessary equipment and materials in ample quantities and as frequently as required to avoid delay in the progress of the Work and shall store them so as not to cause interference with the orderly progress of the Project.

4.11.4 The Contractor shall furnish and pay for all necessary transportation, storage, scaffolding, centering, forms, water, labor, tools, light and power and mechanical appliances and all other means, materials and supplies for properly executing the Work under this Contract, unless expressly specified otherwise in the Contract Documents. The Contractor shall have its representatives at the Site to accept delivered materials. State agencies employees and/or representatives will not accept materials, nor will State agency employees and/or representatives be responsible for damage, theft, or disappearance of the Contractor's materials, equipment, tools, or other property.

4.11.5 Products manufactured in the United States shall be used in this work, whenever available. Wherever practicable, preference shall be given at all times to material and equipment manufactured or produced in the State of New Jersey, where such preference is reasonable and will best serve the interest of the State.

4.11.6 No materials, equipment, or supplies for the Work shall be purchased by the Contractor subject to any lien or encumbrance or other agreement by which an interest is retained by the seller. This clause shall be a condition included in all agreements between the Contractor and its Subcontractors. The Contractor warrants, by signing its invoice, that it has good and sufficient title to all such material, equipment and supplies used by it in the Work, free from all liens, claims or encumbrances.

4.12 TEMPORARY FACILITIES

The Contractor shall be responsible for providing for its own storage areas, employee vehicular parking and staging areas, excavation borrow/spoils designated areas, commercial canteen areas, and all other areas necessary for use by the Contractor. The Contractor shall locate these areas to suit Project requirements, subject to DPMC approval.

4.12.1 Field Offices - The Contractor will provide and maintain during the contract duration an on-Site suitable weather-tight insulated field office conveniently located, and shall maintain therein a complete set of Contract Documents including plans, specifications, CPM network diagrams, Change Orders, logs and other details and Project correspondence. Subject to the DPMC’s written approval and at a date designated by DPMC, the field office may be removed upon enclosure of the building and space may be allocated for field offices within the building. The contents and operations will be transferred to the interior of the Project building by the Contractor, and said office(s) shall be maintained by the Contractor until final acceptance or until the DPMC approves its removal. The Contractor will be responsible to obtain and pay for all permits required for the Contractor’s field offices.

4.12.2 Telephones - The Contractor shall provide its own telephones. The State will be responsible only for the cost of calls made by State employees. if there is a documented cost for same.

4.12.3 Storage - The Contractor will provide and maintain, for its own use suitable and safe temporary storage, tool shops, and employees' sheds for proper protection, storage work and shelter. The Contractor shall maintain these structures properly and remove the structures at the completion of work. The Contractor shall be responsible to maintain

these facilities and the areas around the facilities in a clear and clean manner. The Contractor shall be responsible for correcting defects and damage caused by such use. Rooms in buildings at the Project Site may be used as shops and storerooms, conditioned upon written approval from DPMC.

4.12.4 Toilet Facilities

a. The Contractor shall provide and pay for suitable temporary toilets at an approved location on the Site and prior to the start of any field work. The toilet facilities shall comply with federal, State and local laws and regulations. The Contractor will be responsible for maintenance, removal and relocation as described hereinafter.

b. The Contractor shall provide a temporary toilet and/or indoor toilet connected to water and sewer to accommodate the meeting room and the Architect/Engineer's office, as well as the DPMC office.

c. Toilets shall be serviced by a qualified and experienced firm authorized to maintain services.

d. Each portable toilet facility shall be maintained in a neat and clean condition and serviced at least twice a week, including the removal of waste matter, sterilizing, recharging tank, refilling tissue holders, and thoroughly cleaning and scrubbing entire interior.

e. Toilet facilities in a multiple-story building shall be located on no less than every other floor, unless otherwise directed in writing.

f. Toilet service shall be relocated inside the building and connected to water and sewer as the progress of the Work will allow.

g. When temporary toilets are connected to water and sewer lines, precautions shall be taken to prevent freezing.

h. The Contractor shall remove the temporary toilet units from the Work Site at the completion of the Work, or when so directed by the DPMC or the Architect/Engineer.

i. Workers are not to use the finished bathroom and toilet facilities in the Project buildings. Reasonable steps must be taken by the Contractor to enforce this rule.

4.12.5 Access, Roads and Walks

a. The Contractor shall be responsible for providing and maintaining unobstructed traffic lanes on the designated construction access routes shown on the Contract Drawings or as reasonably required so as to perform the Work. The Contractor shall provide and maintain all reasonably required safety devices. The Contractor shall provide any necessary additional materials, grading and compaction, and shall remove snow and debris as necessary to provide and maintain the access roadbed and pedestrian ways in serviceable condition.

b. The Contractor shall be responsible for constructing and maintaining all roadways, drives and parking areas within or proximate to the Site free and clear

of debris, gravel, mud, snow, ice, or any other Site materials, by ensuring that all reasonably necessary measures are taken to prevent such materials from being deposited on such surfaces. This includes, as may be appropriate, the cleaning of vehicle wheels and/or other necessary maintenance, prior to exit from the Construction Site. Should such surface require cleaning, the Contractor will clean these surfaces without additional cost to the State. The Contractor will be held accountable for any citations, fines, or penalties imposed on the State for failing to comply with local rules and regulations related to Site and off-Site maintenance.

c. The Contractor shall not commence final construction of permanent driveways, parking areas or walks without the written approval of the DPMC. The Contractor shall provide additional materials and labor for maintaining and reworking the sub-grade prior to completion of the Work, to ensure improvements conform fully to the specifications.

d. The Contractor shall obtain written permission from the State for the use of any existing driveways or parking areas not specifically designated for such use in the Contract Documents. If permission is granted, the Contractor shall maintain such driveways and areas in good condition during the construction period, and at the completion of the Project, shall leave them in the same or better condition as at the start of the Work. Conditions before use shall be carefully photographed and documented by the Contractor.

4.12.6 Light and Power

a. The Contractor shall extend electrical service to the building or buildings at locations approved by the DPMC. Temporary electrical service shall be independent of the existing permanent service. Initial temporary service shall be three phase or single phase as indicated in the Contract Documents. The Contractor is responsible to investigate and verify the appropriateness and availability of electrical service with the local utility company prior to the bid date. The Contractor’s bid shall be deemed to include all costs associated with providing this power. Temporary light and power installations, wiring, and miscellaneous electrical hardware must meet the electrical Code and will be inspected by NJUCC officials. The Contractor shall provide the necessary distributing facilities and a meter, and shall pay the cost of running temporary services from the nearest utility company power pole. All costs shall be included in the Contractor's bid.

b. In the event that a water well is the source of water supply for the Project, the extension of electrical service shall include the necessary wiring of sufficient capacity to the location of the well for the operation of the well pump. Where service of a type other than herein mentioned is required, the Contractor requiring it shall install and pay all costs of such special service. The size and incoming service and main distribution switch and panel shall be sized as any service by NEC requirements.

c. The Contractor shall provide all electrical service for the operation of elevator equipment during construction.

d. The Contractor shall pay for the cost of all electric energy used on distribution lines installed.

e. The Contractor shall provide and pay for all maintenance, servicing, operation and supervision of the service and distribution facilities.

f. If the Contractor fails to carry out its responsibility in the supplying uninterrupted light and power as set forth herein, the Contractor shall be held responsible for such failure, and the DPMC shall have the right to take such action as is deemed proper for the protection and conduct of the Work. Any costs associated with DPMC obtaining or supplying light and power shall be deducted from any payment due to the Contractor.

g. The Contractor shall comply with the requirements of the Federal Occupational Safety and Health Act of 1970 with regard to temporary light and power.

4.12.7 Temporary Enclosures

Whenever necessary in order to maintain proper temperatures for the execution or protection of the Work, the Contractor shall furnish and maintain temporary enclosures for all openings in exterior walls that are not enclosed with finished materials. Temporary wood doors shall be provided at door openings.

4.12.8 Temporary Heating, Ventilation and Air Conditioning

a. Prior to Enclosure - Prior to the building being enclosed by walls and roof, if the outside temperatures falls below 45 degrees Fahrenheit (“F”) at any time during the day or night, and heat is required for work in progress or for its protection or curing, the Contractor shall furnish, at its expense, acceptable means to provide sufficient temporary heat to maintain a temperature required by the Work being performed but in no case less than 45 degrees F.

b. Generally Enclosed

(1) For the purposes of establishing the beginning of the Contractor's obligation to provide temporary heat, a building or major unit thereof shall be considered generally enclosed when (a) the exterior walls have been erected, (b) a temporary roof or permanent roof is installed and in a watertight condition, and (c) temporary or permanent doors are hung and window openings are closed with either permanent or temporary weather-tight enclosures. A major unit of buildings as referred to herein shall be: (a) an entire separate structure, or (b) a fully enclosed wing which shall have a floor area equal to at least 50% (fifty percent) of the total floor area of the Project.

(2) As soon as the DPMC determines that the building, or a major unit thereof, is "generally enclosed" by walls and roof, and when the outside temperature falls below 55 degrees F. at any time during the day or night, the Contractor shall furnish sufficient heat by the use and maintenance of LP gas heaters or other acceptable means to maintain a temperature of not less than 55 degrees F. within the enclosed area of the building at all

times, and shall remove such heaters when no longer required. The Contractor will be held responsible for providing temporary heat and for all damages resulting from freeze-ups, for the duration of the Project from the time the building is generally enclosed to final acceptance and occupancy. The Contractor shall remove soot, smudges, and other deposits from walls, ceilings, and all exposed surfaces which are the result of the use of heating equipment, including the permanent heating system, during the period of its use for supplying heat. The Contractor shall not do any finish work until the areas are properly cleaned. The Contractor shall provide or arrange, at its own expense, supervision of the heating equipment at all times prior to providing heat, using the permanent heating system. This obligation shall commence immediately after the acknowledged permanent enclosure of the building or buildings, as confirmed by the DPMC. The Contractor shall furnish and pay for all fuel for heat required during the period when the building is generally or permanently enclosed.

(3) The Contractor shall not assume that the permanent heating system or any part thereof will be available for furnishing of temporary heat during the period for which temporary heat is required. The Contractor's base bid price shall therefore include the cost of all equipment necessary for providing temporary heat as required by the Contract Documents. The Contractor may use the permanent heating system, with written approval from DPMC. Such use however does not cause to commence the equipment's warranties and guarantees. The equipment's warranties and guarantees shall not commence to run until the State takes beneficial use of the Project and facility for the purposes intended.

(4) All heating equipment shall be NFPA-approved and connected to approved flues to the atmosphere. Heaters shall be approved by a recognized testing laboratory and must be equipped with a positive shut-off safety valve.

(5) Storage of gas cylinders within the building will not be permitted at any time.

(6) The Contractor shall provide fire extinguishers on each floor where heaters are used, and the areas must be adequately ventilated.

c. Permanent Enclosure

(1) When the building enclosure has been confirmed by the Architect/Engineer has been completed in accordance with the Contract Documents, and to the satisfaction of DPMC, it shall be considered permanently enclosed. The Architect/Engineer will also confirm in the job meeting minutes that the building, or a major unit thereof, is permanently enclosed.

(3) The Contractor shall install adequate controls to make such temporary connection as required for the operation of the HVAC system.

Should the heating system be designed for the tie-in to existing steam lines for resource of heat, the State will provide steam for temporary heat through the Project permanent heating system, at no cost to the Contractor, after the tie-in is completed by the Contractor.

(4) When the building enclosure has been confirmed by the A/E as completed, the Contractor may request permission to operate the permanent HVAC system to meet its temporary HVAC obligation. The Contractor shall maintain a minimum temperature of 55 degrees F., or a higher temperature, not to exceed 75 degrees F., as may be directed by the Contract Documents for the proper conduct and protection of the Work. The Contractor shall do so until such time as its work is completed and accepted and the Contractor is relieved of this requirement in writing by the DPMC. The Contractor shall pay for and be responsible for the maintenance in accordance with the manufacturer's recommendations, operation and supervision of the HVAC system, including the cost of all water, electricity, and fuel, until the State assumes beneficial occupancy/use of the Project.

4.12.10 Temporary Water

a. The Contractor shall provide, protect and maintain an adequate valved water supply. If the source of water supply is a well, provisions covering the supply water will include the installation of necessary power-driven pumping facilities. The well shall be protected against contamination. The water supply shall be tested periodically by the Contractor, and if necessary, shall be chlorinated and filtered. All costs of providing water will be paid for by the Contractor.

b. The Contractor is responsible to protect all temporary and permanent water lines from damage or freezing. Should water connections be made to an existing line, the Contractor shall provide a positive shut-off valve at its own cost and expense.

4.12.11 Standby Personnel

If, pursuant to trade agreement to which the Contractor is a party, the Contractor is obligated, to employ standby personnel then the Contractor shall determine and include all such costs thereof in its bid proposal. The Contractor shall not, at any time, make a claim to the State for costs relating to standby maintenance or standby supervision for electric motor-driven or other equipment.

4.12.12 Dust Control

a. The Contractor shall provide and maintain necessary temporary dust-proof partitions around areas of Work in any existing building or in new building areas as directed by the Architect/Engineer or the DPMC.

b. The Contractor shall provide and maintain Site dust control of Projects with on-Site construction as directed by the Architect/Engineer or the DPMC.

4.13 STORAGE AND SITE MAINTENANCE

4.13.1 The Contractor shall confine its apparatus, the storage of its equipment, tools and materials, and its operations and workers to areas permitted by law, ordinances, permits, and Contract as set forth in the Contract Documents, the rules and regulations of the State, or as ordered by the DPMC. The Contractor shall not unreasonably encumber the Site or the premises with materials, tools and equipment.

4.13.2 The Contractor shall, at all times during the progress of the Work keep the premises and the job Site free from the accumulation of all refuse, rubbish, scrap materials and debris caused by its operations and/or the actions of its employees, Subcontractors and/or workers, to ensure that, at all times, the premises and Site shall present a neat, orderly and workmanlike appearance. This is to be accomplished as frequently as is necessary by the removal of such refuse, rubbish, scrap materials and debris from the Site and the State's premises. Loading, cartage, hauling and dumping of same will be at the Contractor's expense.

4.13.3 At the completion of the Work, the Contractor shall remove all of its tools, construction equipment, machinery, temporary staging, false work, mock-ups, form work, shoring, bracing, protective enclosures, scaffolding, stairs, chutes, ramps, runways, hoisting equipment, elevators, derricks, cranes, and any other materials and equipment brought onto the Project Site.

4.13.4 Should the Contractor not promptly and properly discharge its obligation relating to Site maintenance and/or final clean up, the State shall have the right to employ others and to charge the resulting cost to the Contractor after first having given the Contractor a three-working day written notice of such intent.

4.13.5 The Contractor's responsibilities for final clean up shall include:

a. Removal of all debris and rubbish resulting from or relating to the Contractor's work. Rubbish shall not be thrown from building openings above the ground floor unless contained within chutes.

b. Removal of stains from glass and mirrors. Glass shall be washed and polished inside and outside.

c. Removal of marks, stains, fingerprints, soil, dust or dirt from painted, decorated or stained woodwork, plaster or plasterboard, metal acoustic tile and equipment surfaces.

d. Removal of spots, paint and soil from resilient, glazed and unglazed masonry and ceramic flooring and wall work.

e. Removal of temporary floor protections; and cleaning, washing or otherwise treating and/or polishing, as directed, all finished floors.

f. Cleaning of exterior and interior metal surfaces, including doors, window frames and hardware, of oil stains, dust, dirt, paint, etc. Polishing and removal of fingerprints or blemishes from such surfaces shall be completed, as applicable.

g. Restoration of all landscaping, roadways and walkways to preexisting condition. Damage to trees and plantings shall be repaired in the next planting season, and such shall be guaranteed for one year from the date of repair and/or replanting.

4.13.6 All construction equipment, materials and/or supplies of any kind, character or description, regardless of value, which remain on the job Site for more than 30 (thirty) calendar days from the date of the Certificate of Final Acceptance, shall become the property of the State. Such construction equipment, materials and/or supplies will be disposed of in any manner the State shall deem reasonable and proper. The cost of this disposal will be deducted from any sums due the Contractor. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the State.

4.14 CUT-OVERS AND INTERRUPTIONS

All cut-overs of mechanical and electrical services to existing buildings shall be approved, scheduled and coordinated in advance with the DPMC's representative and performed at a time convenient to the occupants of said buildings so as not to unreasonably interfere with its operations.

4.15 PROTECTION/SAFETY

4.15.1 Safety Precautions and Programs – The Contractor shall be responsible for initiating, maintaining and supervising all required safety precautions and programs in connection with the Work. The Contractor shall designate a responsible member of its organization at the Site whose duty shall be the prevention of accidents. This person shall be competent to review, implement and coordinate the safety programs being performed as required by Occupational Safety and Health Administration (OSHA) or any other agency having authority over safety on a State Construction Site.

4.15.2 Protection of Persons

a. The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

(1) Every employee on the Site and all other persons who may be affected thereby;

(2) All the Work and all materials and equipment to be incorporated therein, whether in storage on or off the Site, under the care, custody or control of the Contractor, or any of its Subcontractor(s) or lower tier sub-Subcontractor(s); and

(3) Other property at the Site or adjacent thereto (whether owned by the State or not), including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

b. The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss.

c The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including but not limited to rails, night-lights, aircraft warning lights, the posting of danger signs and other warnings against hazards, promulgating safety regulations, notifying Owners and users of adjacent utilities and other means of protection against accidental injury or damage to persons and property.

d. The Contractor shall not load or permit any part of the Work to be loaded so as to endanger the safety of the project, its employees, or any other person on the project Site.

e. The Contractor shall promptly remedy all damage or loss to any property caused in whole or in part by the Contractor, any of its Subcontractors, lower tier Subcontractors, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable and for which the Contractor is responsible. These obligations are in addition to those stated elsewhere herein.

4.15.3 Protection of Property

The Contractor shall have full responsibility to install, protect, and maintain all materials and supplies in proper condition whether in storage or off the site and to immediately repair and/or replace any such damage until Final Acceptance. The Contractor shall maintain an inventory of all materials and supplies for the Work at the Site, that are delivered to the site, or delivered to approved off-site storage facilities. The State shall not be liable for any damage, theft or negligent injury to the Contractor's property.

4.15.4 Hazardous Materials

a. When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

b. The Contractor shall maintain all records, reports and files of the general storage and handling of hazardous materials as required by any and all federal, State and/or local regulatory agencies.

4.16.5 Emergencies

In any emergency affecting the safety of persons or property, the Contractor shall act with diligence to prevent threatening injury, damage or loss. In such case, the Contractor shall immediately, but in no case, not more than 24-hours following the emergency, notify the DPMC and the Architect/Engineer of the action taken.

4.16 UNCOVERING AND CORRECTION OF WORK

4.16.1 Uncovering of Work

a. The Contractor is obligated to provide reasonable notice to the DPMC and/or the Architect/Engineer of all work scheduled to be covered, to permit DPMC and the Architect/Engineer the opportunity to inspect the Work prior to actual covering. If any portion of the Work is covered prior to inspection by the DPMC or the Architect/Engineer, it shall be uncovered for observation. Uncovering and replacement of the covering shall be at the Contractor's expense.

b. The DPMC and/or the Architect/Engineer may request any work be uncovered by the Contractor for inspection. If such work is found to be in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be reimbursed to the Contractor. If such work is found not to be in accordance with the Contract Documents, the Contractor shall pay all associated costs.

4.16.2 Correction of Work

a. The Contractor shall promptly correct all work rejected by the DPMC or the Architect/Engineer as defective or failing to conform to the Contract Documents, whether observed before or after final acceptance and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected work, including the costs of all consultant services including but not limited to the Architect/Engineer's additional services.

b. The Contractor shall remove from the site, at its own expense, all portions of the Work which are defective or non-conforming and which have not been corrected, unless removal is waived by the DPMC.

c. If the Contractor fails to correct defective or non-conforming work in a reasonable time fixed by written notice from DPMC, then DPMC may make arrangements for such correction by others and charge the cost of so doing to the Contractor.

d. If the Contractor does not proceed with the removal and correction of such defective or non-conforming work within a reasonable time, fixed by written notice from the DPMC or the Architect/Engineer, any materials or equipment shall become the property of the State and the DPMC may remove and dispose the non-conforming work in any manner to best meet the interest of the State. If such material is sold and the proceeds of the sale do not cover all costs which the Contractor should have borne and any additional cost incurred by the State in the uncovering, removal, disposal and correction of non-conforming work, the difference shall be charged to the Contractor and an appropriate credit Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the State.

e. The Contractor shall be responsible for the cost of making good all work destroyed or damaged by such correction or removal.

f. Notwithstanding other obligations within the Contract Documents, nothing contained herein shall be construed to establish a time or date limitation upon which the DPMC must discover non-conforming work.

4.16.3 Acceptance of Non-Conforming Work

The DPMC may determine that the best interests of the State will be served by accepting defective or non-conforming work instead of requiring its removal and correction. In such instance, the DPMC may, by any means available, exact an appropriate reduction in the Contract sum. Such adjustment shall be effected regardless of final payment having previously been made, and the Contractor and/or its surety shall be responsible for promptly remitting any funds due the State as a result thereof.

4.17 LAYOUT AND DIMENSIONAL CONTROL

4.17.1 The Contractor shall be responsible for locating and laying out the building and all of its parts on the site, in strict accordance with the Contract Documents, and shall accurately establish and maintain dimensional control. The Contractor shall employ and pay for the services of a competent and licensed New Jersey engineer or land surveyor who shall be pre-qualified by DPMC to perform all layout work, and to test the level of excavations, footing base plates, columns, walls and floor and roof lines, and furnish to the Architect/Engineer, as the Work progresses, certifications that each of such levels is as required by the drawings. The plumb lines of walls, shall be tested and certified by the surveyor as the Work progresses.

4.17.2 The Contractor's engineer/surveyor, in the course of layout work either on the site or within any building, shall establish all points, lines, elevations, grades and bench marks for proper control and execution of the Work. The Contractor's engineer/surveyor shall establish a single permanent benchmark as set forth in the Contract Documents to which all three coordinates of dimensional control shall be referenced. The Contractor's engineer/surveyor shall verify all Owner-furnished survey data including but not limited to topographical and utility location points, lines, elevations, grades and benchmarks, and buildings. Should any discrepancies be found between information given on the Contract Documents and the actual site or field conditions, the Contractor shall notify DPMC and the Architect/Engineer in writing of such discrepancy, and shall not proceed with any work affected until receipt of written instructions from the DPMC.

4.18 PROJECT SIGN

The Contractor shall erect and maintain one sign at the Project Site, as set forth in the Contract Documents and located as directed by the Architect/Engineer. Painting shall be done by a professional sign painter, with two coats of exterior paint, colors, letter face and layout as shown. No other sign will be permitted at the site. Upon completion of the Project, and when directed by the Architect/Engineer or the DPMC, the Contractor shall remove the sign.

4.19 SECURITY

4.19.1 The Contractor shall provide all locks, doors and security construction and personnel as required to secure the Project building throughout the period of construction.

4.19.2 The Contractor shall be responsible for the security of any temporary structures located on the premises outside of the building and/or any stored materials.

4.20 DPMC FIELD OFFICE

4.20.1 The Contractor will provide on-site, suitable, separate, weather-tight, insulated (floor, walls, ceilings) field office facilities for the use of DPMC personnel, as more fully described in the Contract Documents. At a minimum, the Contractor is to supply this field office with toilet facilities, heating and air conditioning, tables and chairs, and phone and data communication lines. At a time determined by the DPMC or the Architect/Engineer, the Contractor shall remove field facilities upon enclosure of the Project building and shall relocate the contents and operations of the field office to the interior of the Project building until completion of the Project.

4.20.2 The Contractor shall be responsible for the maintenance of both offices and the meeting room, including the cost of heating, air conditioning, electric current, and janitorial service.

4.21 PHOTOGRAPHS

4.21.1 The Contractor shall submit monthly progress photographs in duplicate to the DPMC, giving six (6) views of the Work with each application for payment until the Project is completed,.

4.21.2 The photographs shall be 8" by 10" shall bear the date and time of the exposure, the DPMC Project number and title, the names of the Contractor and the name of the Architect/Engineer. All photographs shall also be submitted in digital format.

4.22 REPAIR OF FINISHED SURFACES, APPLIED FINISHES, GLASS

4.22.1 The Contractor accepts sole responsibility for repair of uncontrolled dislodging, cracking, delaminating or peeling of finished surfaces such as concrete, pre-cast concrete, cast and natural stone, unit masonry, millwork, plaster, glass and applied finishes such as compound, paint, and special coatings, within the Contract Work and the limits of specified guarantee periods, regardless of the cause.

4.22.2 The Contractor shall be responsible for replacement of all broken glass, regardless of the cause. The Contractor shall replace all broken, scratched or otherwise damaged glass before the completion and acceptance of the Work. If breakage is caused by the Owner, the Contractor will be reimbursed for the replacement costs. The Contractor shall wash all glass on both sides at completion, or when directed, removing all paint spots, stains, plaster, and other materials.

ARTICLE 5 - SUBCONTRACTORS

5.1 SUBCONTRACTORS AND MATERIAL SUPPLIER APPROVALS

5.1.1 Upon their execution, but not less than fourteen (14) calendar days prior to Subcontractor mobilization on the site, and/or Subcontractor billing, the Contractor shall forward to the Architect/Engineer on the form provided by the DPMC the names of all its Subcontractors and suppliers, of such others as the DPMC may direct, proposed to perform the principal parts of the Work. The Contractor shall forward the appropriate DPMC form to the Architect/Engineer for approval. Department of Labor Contractor Registration and New Jersey Business Registration Certificate are required for all Subcontractors.

5.1.2 If the DPMC has objection to any proposed or approved Subcontractor and/or material supplier, the Contractor shall substitute another Subcontractor and/or material supplier acceptable to DPMC. Under no circumstances shall the State be obligated for additional cost due to such substitution.

5.1.3 After the acceptance of bids, the Contractor shall make no substitution of any Subcontractor person or firm previously selected and approved, without prior written approval from the Architect/Engineer and DPMC. A Contractor seeking to substitute a Subcontractor person or firm shall provide written request for substitution no less than fourteen (14) calendar days prior to the execution of Work by the Subcontractor or material supplier.

5.1.4 Approval of a Subcontractor or material supplier by the DPMC and Architect/Engineer shall not relieve the Contractor of the responsibility of complying with all provisions of the Contract Documents. The approval of a Subcontractor or material supplier does not imply approval of any construction, material, equipment or supplies.

5.2 CONTRACTOR-SUBCONTRACTOR RELATIONSHIP

5.2.1 The Contractor acknowledges its full responsibility to the State for the acts and omissions of its Subcontractors and lower tier subcontractors, and of persons and firms either directly or indirectly employed by them, equally to the extent that the Contractor is responsible for the acts and omissions of persons and firms directly or indirectly employed by it. The Contractor acknowledges that it remains fully responsible for the proper performance of its Contract regardless of whether work is performed by the Contractor's own forces or by Subcontractors engaged by the Contractor.

5.2.2 Nothing contained in the Contract Documents shall create any contractual relationship between any Subcontractor and the State. Further, no Subcontractor or material supplier shall be deemed an intended third party beneficiary under this Contract.

5.2.3 The Contractor and all Subcontractors agree that, in the employment of both skilled and unskilled labor, preference shall be given to residents of the State of New Jersey, if such labor force is available.

5.2.4 The Contractor shall require, in its agreements with Subcontractors and as a condition of agreement, that each Subcontractor require in its agreement(s) with lower tier Subcontractors and Suppliers, that the Subcontractor understands that there is no contractual obligation of any kind between the State and Subcontractor and the Subcontractor's sole recourse lies with the Contractor and/or the surety, and not with the State, that each Subcontractor and lower tier Subcontractor, bound by the terms of the Contract Documents for this Contract, and assume toward the Contractor all the obligations and responsibilities which the Contractor assumes, pursuant to the Contract Documents.

ARTICLE 6 - CONSTRUCTION PROGRESS SCHEDULE

6.1 GENERAL

The State may contract for the services of a Critical Path Method (CPM) scheduling consultant for Project planning, scheduling and cost control. If such has been arranged, then section 6.2 shall apply to the Contract between the State and the Contractor. In the absence of a statement in the bid documents that a CPM consultant has been retained by the State, then section 6.3 shall apply.

6.2 CONSTRUCTION PROGRESS SCHEDULE (CRITICAL PATH METHOD -- CPM CONSULTANT RETAINED BY THE STATE)

6.2.1 Critical Path Method

a. The Project will be monitored by a detailed critical path method scheduling system. This system shall be the basis for the evaluation of the Contractor's performance and for progress payments to the Contractor.

b. The Contractor shall provide all the information necessary for the CPM consultant employed by DPMC to develop a CPM network plan demonstrating complete fulfillment of all construction Contract requirements and, as necessary, for the CPM consultant to maintain an accurate CPM schedule throughout the Project. The Contractor, in consultation with the CPM consultant, will establish construction logic and activity time duration consistent with Contract documents and Project requirements. The CPM consultant will establish the level of detail to be reflected on the CPM schedule. The Contractor shall utilize the schedule in planning, coordinating and performing the Work, including all activities of Subcontractors, equipment vendors and material suppliers.

c. The Contractor agrees that the CPM consultant's Project network schedule is the designated plan for completion of all work in the allotted time, and the Contractor will assume full responsibility for the execution of the Work as shown. The Contractor shall indicate formal acceptance of the schedule by signing the final initial (baseline) network diagrams and computer schedule listing.

d. The Contractor shall furnish sufficient labor and construction equipment to ensure the execution of the Work in accordance with the approved CPM progress schedule. If, in the opinion of the DPMC, a Contractor falls behind the CPM progress schedule, the Contractor shall take any and all such steps as may be necessary to bring its work into compliance with the CPM progress schedule. The DPMC may require the Contractor to increase the number of shifts, days of work and/or the amount of construction labor, plant and equipment, all without additional cost to the State.

e. The Contractor shall make no claim for, and have no right to, additional payment or extension of time for completion of the Work, or any other concession because of any misinterpretation or misunderstanding on the Contractor's part of the CPM progress schedule, the Contractor's failure to attend the pre-bid

conference, or because of any failure on the Contractor's part to become fully acquainted with all conditions relating to the CPM progress schedule and the manner in which it will be used on the Project, or because of any Subcontractor's failure to properly participate in the development of a CPM progress schedule or to perform the Contract in accordance with the CPM progress schedule.

6.2.2 Initial Submittal

a. To the extent necessary for the CPM consultant to reflect in the network diagrams the plan for completion of this Contract, the Contractor shall meet with and assist the CPM consultant and furnish, within ten (10) calendar days after award of this Contract, all necessary information for the preparation of the CPM progress schedule. This information shall include, but not necessarily be limited to, a logical sequencing of work operations, activity time estimates, intended crew flow, activity costs and estimated manpower requirements for each activity.

(1) The network diagram shall show the sequence and interdependence of activities required for the Project. In preparing the network diagram, the Contractor shall assist the CPM consultant by breaking up the Work into activities of a duration of no longer than ten (10) working days each, except as to non-construction activities (such as procurement of materials, delivery of equipment and concrete curing) and any other activities for which the CPM consultant may approve the showing of longer duration. The diagram shall show not only the activities for actual construction but also such activities as the Contractor's submittal of shop drawings, templates and equipment, material fabrication, delivery of equipment and material, substantial completion, final completion, punch list and closeout, and the delivery of Owner-furnished equipment, if applicable. The Contractor shall provide activity durations to the CPM consultant for each activity on the diagram.

(2) If requested by the CPM consultant, the Contractor shall furnish any information needed to justify the reasonableness of activity time duration. Such information shall include, but not be limited to, estimated activity manpower, unit quantities, and production rates.

(3) Failure by either the Contractor or the CPM consultant to include any element of work required for the performance of the Contract shall not excuse the Contractor from completing all work required within any applicable date, notwithstanding DPMC approval of the network diagrams.

(4) The CPM consultant will establish the level of detail to be reflected in the CPM system.

(5) Seasonal weather conditions shall be considered in the planning and scheduling of all work influenced by high or low ambient temperatures for the completion of all Contract work within the allotted Contract duration. In addition, appropriate allowances shall be made for anticipated time losses due to normal rain and snow conditions based on

the previous five year average for that geographical area, by statistically expanding the estimated time duration for weather-sensitive activities, to ensure that the required completion date is achieved.

b. The Contractor shall be prepared to meet as many times as necessary with the CPM consultant to develop the information required for the timely development of the progress CPM schedule.

c. The Contractor shall furnish a breakdown of its total Contract price by assigning dollar values to each applicable network activity, coded for the Contractor and each Subcontractor, which cumulatively equals the total Contract amount. Upon acceptance by DPMC, the values will be used as a basis for determining progress payments. Progress payments to the Contractor shall be dependent upon final acceptance by DPMC of the cost-loaded progress CPM schedule.

d. Accompanying the network diagram and computer scheduling listing, the CPM consultant will furnish a computer-generated cost requisition listing, which will provide a separate tabulation of each activity shown on the CPM schedule in order of bid item or trade responsibility code as agreed to by DPMC. This listing will show, for each activity, the Contractor and each Subcontractor, the estimated dollar value of Work in place for totally or partially completed activities, including subtotals by bid items and grand totals for the entire Project. The cost requisition listing will also contain monthly activities reflecting the cost of Project overhead and administrative expenses, and activities reflecting the monthly cost of administering Project General Conditions.

6.2.3 Review and Approval:

a. After receipt of the initial network diagram, computer-produced schedule and cost requisition listing, the DPMC representative shall meet with the Contractor and CPM consultant for joint review, correction, or adjustment of the proposed plan and progress CPM schedule to evaluate the cost values assigned to each activity. Within ten (10) calendar days after the joint review, the CPM consultant will revise the network diagram and/or computer-produced schedule in accordance with agreements reached during the joint review, and shall submit two (2) copies each of the revised network diagram, computer-produced schedule and cost requisition listing to DPMC. The revised schedule documents will be reviewed by DPMC and, if found to be as agreed upon, will be approved. A copy of each will be returned to the CPM consultant for distribution and the CPM consultant shall forward same to the Contractor by email and/or overnight mail. The Contractor shall review these documents and shall indicate acceptance by signing the schedule documents. If the Contractor objects to the schedule documents, the Contractor shall forward these objections in writing to DPMC within ten (10) calendar days of the date of receipt of same or be deemed to have accepted the schedule documents. Objections shall include the precise activities of the schedule to which the Contractor objects and identify the basis of the objection. The Contractor will then meet with the DPMC representative and the CPM consultant to review the Contractor's objections. The CPM consultant may

revise the network diagram and the computer-produced schedule in accordance with the agreements reached during this final review and shall submit two (2) copies each of the revised network diagram, computer-produced schedule and cost requisition listing to DPMC. The re-submission will be reviewed by DPMC and, if found to be as agreed upon, will be approved and a copy of each will be returned to the CPM consultant for distribution and the CPM consultant shall forward same to the Contractor by email and/or overnight mail. The Contractor shall review these schedule documents to ensure that that the documents reflect all changes agreed upon, accept and sign. The Contractor shall indicate its acceptance by signing the scheduling documents, computer-produced schedule and cost requisition. Approval will be without reservation, and the Contractor will be deemed to have accepted the schedule as adequate, proper and binding in all respects and shall not raise further objections to the schedule.

b. After the network diagrams and computer-produced schedule have been signed by the Contractor, the CPM consultant shall forward to the Contractor and DPMC one set of copies of the network diagrams and computer-produced schedule. The network diagram and the computer-produced schedule with approved signatures shall constitute the Project work schedule until subsequently revised in accordance with the requirements of this section.

6.2.4 Progress Reporting and Changes:

a. Once every month, or more often if required by DPMC, the Contractor shall meet with the CPM consultant and DPMC's representative(s) and provide the information necessary for the CPM consultant to prepare and submit to DPMC a revised (updated) network diagram and computer-generated schedule listing showing:

(1) Approved changes in activity sequencing;

(2) Changes in activity duration for activities not started or partially completed where agreed upon;

(3) The effect on the network of any delays in any activities in progress, and/or the impact of known delays which are expected to affect future work;

(4) The effect of Contractor modifications (activity duration, logic and cost estimates) to the network;

(5) Changes to activity logic, where agreed upon, to reflect revision in the Contractor's work plan, i.e., changes in activity duration, cost estimates, and activity sequences for the purposes of regaining lost time or improving progress; and

(6) Changes to milestones, due dates, and the overall Contract completion date which have been agreed upon by DPMC since the last revision of the CPM schedule.

b. The CPM schedule shall accurately reflect the manner in which the Contractor intends to proceed with the Project and shall incorporate the impact of

all delays, Change Orders and change events as soon as these factors can be defined. All changes made to the schedule shall be subject to approval by DPMC prior to inclusion in the CPM schedule. If the DPMC representative and the Contractor are unable to agree as to the amount of time to be allowed for Change Order work, or the manner in which the Work is to be reflected on the network diagram, the CPM consultant will reflect the logic and time duration furnished by the Contractor for the Change Order work pending final DPMC decision. If non-approved Contractor logic and time durations are used, the Contractor agrees that any time which is projected to be lost on the Project as a result of these schedule changes will be considered the responsibility of the Contractor until a final agreement has been made or a final decision rendered by DPMC regarding the manner in which the Change Order work is to be reflected on the schedule. When this final decision has been made by DPMC, the CPM consultant shall revise the CPM schedule in accordance with such decision and issue a final analysis of the effect of the change on the Project.

c. If the Contractor desires to revise the logic of the approved progress CPM schedule to reflect a sequence of construction that differs from that to which was previously agreed, the Contractor must first obtain the approval of DPMC.

(1) Once each month, at the same time the network is updated, the CPM consultant, the Contractor and the DPMC representative(s) shall jointly make entries on the preceding network diagram schedule to show actual progress, identify those activities started by date and those completed by date during the previous period, show the estimated time required to complete each activity started but not yet completed, show activity percent completed and/or dollars earned, and reflect any changes in the network diagram approved in accordance with the preceding paragraph. After completion of the joint review and DPMC's approval of all entries, the CPM consultant will submit updated network diagrams, an updated computer-produced calendar-dated schedule and cost requisition listing to DPMC.

(2) The resultant monthly CPM computer printout and network diagrams shall be recognized by the Contractor as its sole updated construction schedule to complete all remaining Contract work.

(3) In addition to the foregoing, once each month the Contractor will receive a narrative report prepared by the CPM consultant. The narrative report will include a description of the amount of progress made during the last month in terms of completed activities in the plan currently in effect, a description of problem areas, current and anticipated delaying factors and the estimated impacts the delays have on the performance of other activities and completion dates, and recommendations on corrective action for the Contractor. Within seven (7) calendar days after receipt of this report, the Contractor shall submit to DPMC a written explanation of corrective action taken or proposed. The DPMC, after reviewing the written submission, may take appropriate action.

6.2.5 Payments to Contractor

a. The monthly submission of the computer-produced calendar-dated schedule shall be an integral part and basic element of the estimate upon which progress payments shall be made pursuant to the provisions of Article 9 of these General Conditions. The Contractor shall be entitled to progress payments only upon receipt by DPMC of an updated computer-produced calendar-dated schedule and cost requisition listing.

b. Payments to the Contractor shall be based upon the results of the computer-generated cost requisition listing which shall be prepared in conjunction with each updating of the CPM system as described above. The Contractors shall provide sufficient documentation to confirm reported progress for any cost items appearing in the scheduling and requisition system.

c. Payments to the Contractor shall be dependent upon the Contractor furnishing all of the information which, in the judgment of DPMC, is necessary to ascertain actual progress, and all the information and data necessary to prepare any necessary revisions to the computer-produced calendar-dated schedule, cost requisition listing and/or the network diagram. DPMC's determination that the Contractor has failed or refused to furnish the required information shall constitute a basis for withholding payments until the required information is furnished and the schedule and/or diagram is prepared or revised on the basis of such information.

6.2.6 Biweekly Progress Meetings

a. Every two (2) weeks or as otherwise directed by DPMC, the Contractor shall attend a coordination and CPM scheduling meeting on the job site. At this meeting, the Contractor shall provide detailed information regarding the Work schedule to be performed during the upcoming two weeks to permit the CPM consultant to prepare schedules for the subsequent two week period. Biweekly scheduling by the Contractor shall be in accordance with the priorities and degree of concurrent work required by the official CPM schedule for the Project. The Contractor shall be prepared to explain any difference between the Contractor's biweekly schedules and the priorities required by the latest updating of the official CPM schedule.

b. At the biweekly scheduling meeting, the CPM consultant shall review the schedule for the preceding two (2) weeks, and the Contractor shall report the progress actually achieved for each activity which was scheduled to be performed during the two weeks, including the actual dates on which the Work was performed. The Contractor agrees that this information shall constitute the official historical record of Project progress.

c. At each biweekly scheduling meeting, the Contractor shall document any current delays to work operations. In addition, the Contractor shall provide any available information regarding any potential delays.

(1) Following the biweekly scheduling meeting, the CPM consultant will issue to the Contractor a two-week look-ahead schedule as developed

at the meeting that shall constitute the construction schedule for the coming two weeks. The CPM consultant will also issue a narrative biweekly progress analysis documenting progress achieved during the preceding two weeks and analyze delays reported to constitute current or anticipated impacts to timely construction.

(2) The Contractor shall be represented at the biweekly scheduling meeting by its superintendent, who shall have complete authority to provide the information required for the development of the next two (2) weeks schedule, which includes documentation of past progress and documentation of delays. The Contractor's representatives shall also be authorized to commit to the implementation of corrective action planned to overcome delaying conditions.

6.2.7 Responsibility for Completion

a. The Contractor agrees that, when it becomes apparent from the current project CPM schedule that any Contract completion date will not be met, the Contractor will take any or all of the following actions, as required, at no additional cost to the State:

(1) Increase construction manpower.

(2) Increase the number of working hours per shift, shifts per working days, working days per week, or the amount of construction equipment, or any combination of the above; and/or

(3) Reschedule activities to achieve maximum practical concurrence.

6.2.8 Adjustment of Contract Completion Date

a. The Contract completion dates will not be adjusted except under the specific and limited conditions set forth in the Contract Documents. In the event that the Contractor requests an extension of any Contract completion date, the Contractor shall furnish a justification of such extension and provide any and all supporting evidence that DPMC requires to evaluate the Contractor's request. The DPMC shall either approve, in whole or in part, or reject the Contractor's request and will advise the Contractor in writing of its decision. If the DPMC finds that the Contractor is entitled to any extension of any Contract completion date under the provisions of this Contract, the determination as to the total number of calendar days extension permitted shall be based upon the currently approved Project CPM schedule and on all data relevant to the extension request. Such data will be included in the next updating of the CPM schedule.

b. The Contractor acknowledges and agrees that the evaluation of Project delays and determinations regarding Project time extension will be based upon the Project CPM schedule and the following criteria:

(1) Float time shown on the Project CPM schedule is not for the exclusive use of either the Contractor or DPMC. It is agreed that float time is available for use by all performing Work on the Project, including the Contractor, other contractors, subcontractor, lower tier subcontractors,

and suppliers to facilitate the effective use of available resources and to minimize the impact of problems of Change Orders which may arise during construction. The Contractor specifically agrees that float time may be used by DPMC or its representatives or consultants in conjunction with the review activities or to resolve Project problems. The Contractor agrees that there will be no basis for a Project time extension as a result of any Project problem, Change Order or delay which only results in the loss of available positive float on the Project CPM schedule. The Contractor further agrees that there will be no basis for a claim for cost escalation for any activity which is completed on or before its initially required late end date as shown on the initial approved Project CPM schedule, regardless of the justifiability or any delaying factors which might have resulted in the elimination of float which was originally available for the activity. If the Contractor refuses to perform work that is available to it, the DPMC may consider, the Contractor to be in breach of the Contract, regardless of the float shown to be available for the Work. In such instances, the DPMC may, without prejudice to any other right or remedy, declare the Contractor to be in default and terminate the employment of the Contractor pursuant to Article 12 of the General Conditions.

(2) The Contractor agrees that no time extension will be granted for time lost due to normal seasonal weather conditions. In order to qualify for consideration for a time extension due to adverse weather conditions, it must be shown by clear and convincing evidence that the weather conditions during a given quarterly period (summer, fall, winter, spring) were more severe than the previous five-year (5) average for the Project geographical area, and that these weather conditions critically impacted the final Project completion date by delaying the performance of work on the main Project critical path. If abnormal weather losses can be shown to have affected the Project critical path, a non-compensable time extension will be considered for that portion of the proven weather-related delays, which exceeded normal weather losses that should have been anticipated for the quarterly period in question.

(3) No time extensions will be considered for any weather conditions that do not affect work on the Project critical path as set forth on the current Project CPM schedule. The Contractor agrees that there will be no basis for a claim for any additional compensation resulting from any time extension issued for weather-related delays.

(4) In order for a given cause (i.e., delay, Change Order, etc.) to be considered as a basis for a total Project time extension, it must meet both of the following criteria:

(a) It must be totally beyond the control of the Contractor and due to no direct or indirect fault of the Contractor; and

(b) It must result in a direct delay to work on the main Project critical path.

(5) The Contractor acknowledges and agrees that actual delays to activities that, according to the Project CPM schedule, do not directly affect the main Project critical path and do not have any effect on the Contract completion date or dates, will not be the basis for a change therein.

(6) Concurrent delays are defined as two or more delays or areas of work slippage that are totally independent of one another and which, if considered individually, would each affect the final Project completion date according to the Project CPM schedule. Where the CPM consultant determines that concurrent delays exist, the Contractor acknowledges and agrees that the following criteria will be used to evaluate time extension:

(a) If the current Project CPM schedule shows two (2) or more concurrent delays, with one analyzed to be the responsibility of DPMC and the other analyzed to be the responsibility of the Contractor, a non-compensable time extension will be considered only if the excusable delay affects the main Project critical path and this delay is shown to be a greater amount than the other concurrent delays when the impacts of the concurrent delays are independently considered. In this event, a compensable time extension will be considered only for that portion of time by which the excusable delay exceeds all concurrent non-DPMC caused delays. For example, if an excusable impact delays the Project by one-hundred (100) calendar days and concurrent contract-caused slippage independently delays the final completion date by ninety (90) calendar days, a time extension will only be considered for a maximum of ten (10) calendar days, provided the excusable delay is on the project critical path.

(b) If the CPM schedule shows concurrent delays with some excusable delays and some the fault of the Contractor, and if the Contractor-caused delays are analyzed to be the main determining impact to the main Project critical path, then there will be no basis for a total Project time extension regardless of the nature of the concurrent excusable delays. A concurrent time extension may, however, be considered for that portion of the total Project slippage which is shown on the CPM schedule to be totally attributable to excusable delays.

(c) If a time extension request is being made for concurrent delays which did not affect the Project critical path, this must be clearly stated in the Contractor's time extension request and all CPM activities which are claimed to have been affected by the cited delay must be specifically identified with all applicable impact dates.

6.3 CONSTRUCTION PROGRESS SCHEDULING PROVIDED BY THE CONTRACTOR

6.3.1 The Project shall be completed within the specified number of calendar days from the effective date of the Notice to Proceed.

6.3.2 The Contractor shall be responsible for preparing and furnishing to the DPMC through the Architect/Engineer before the first Contract requisition date, but in no event later than 30 (thirty) days after the effective date of the Notice to Proceed, a coordinated combined progress schedule that incorporates the progress schedules of the Contractors and all Subcontractors engaged on the Project. The schedule shall be in the form of a network diagram or other recognized graphic critical path progress schedule format that indicates, among other things, predecessor and successor activities, and major and intermediate milestones, in sufficient detail to satisfy the DPMC. (See also section 6.3.4 below.) The Contractor's initial invoice will not be processed by the DPMC until and unless such a single coordinated progress schedule has been submitted to and approved by the DPMC. Thereafter, the Contractor shall submit an updated coordinated progress schedule on a monthly basis. Receipt and approval of the updates will be a mandatory condition to payment.

6.3.3 Once each month, or more often if required by the DPMC, the Contractor shall meet with the Architect/Engineer and the DPMC representative to gather the information necessary for the Contractor's preparation of the revised/updated computer generated scheduling reports.

6.3.4 The progress schedule, based upon the logic and time estimates, shall indicate in suitable detail for display, all significant features of the Work of the Contractor and each Subcontractor, including but not limited to, the placing of orders, manufacturing durations, anticipated delivery dates for critical and long-lead items, submissions and approvals of shop drawings, construction activities, all work activities to be performed by the Contractor and its Subcontractors, the beginning and time duration thereof, and the dates of all milestones, substantial and final completion of the various elements of the Work, including punch list and close-out. Reports shall be in booklets, indexed and separated as categorized below. Each activity listed on the Schedule shall include, as a minimum, the following:

a. The activity description;

b. The trade (A/E, Owner, GC, Electrical, Plumbing, HVAC);

c. The duration in calendar days;

d. The Early Start date;

e. The Late Start Date;

f. The Early Finish date;

g. The Late Finish date;

h. The Total Float

6.3.5 The Contractor agrees that no time extension will be granted for time lost due to normal seasonal weather conditions. In order to qualify for consideration for a time extension due to adverse weather conditions, it must be shown by clear and convincing evidence that the weather conditions during a given quarterly period (summer, fall, winter, spring) were more severe than the previous five-year (5) average for the Project geographical area, and that these weather conditions critically impacted the final Project completion date by delaying the performance of work. If abnormal weather losses can be shown to have impacted the Project completion date, a non-compensable time extension will be considered for that portion of the proven weather-related delays, which exceeded normal weather losses that should have been anticipated for the quarterly period in question.

6.3.6 Immediately upon approval by DPMC, the Contractor shall prepare and distribute four copies of the progress schedule to the DPMC plus two copies to the Architect/Engineer. Each monthly updated coordinated schedule shall be signed and dated by the Contractor.

6.3.7 The Contractor shall furnish sufficient labor and construction plant and equipment to ensure the execution of the Work in accordance with the approved progress schedule. If any updated completion time or date for any activity does not conform to the durations or milestones shown in the approved progress schedule, the sequence of activities and/or the time for performance of activities shall be updated on the progress schedule to be approved by the DPMC and cured by the Contractor by any means, including performing concurrent operations, additional manpower, additional shifts, and overtime. No additional charges to the State will be allowed the Contractor for overtime, additional manpower, equipment, additional shifts, etc. (except as may be provided elsewhere in the Contract), if such expediting procedures or measures are necessary to meet the Contract completion date.

6.3.8 The progress schedule shall show:

a. Recommended Changes in activity sequencing;

b. Changes in activity duration for activities not started or partially completed, where agreed upon;

c. The effect on the network of the modifications (activity duration, Predecessors and Successors);

d. Changes for the purposes of regaining lost time or improving progress, and;

e. Changes to milestones, due dates, and the overall Contract completion date, which have been agreed upon by the DPMC's project manager since the last revision of the progress schedule.

6.3.9 The progress schedule shall accurately reflect the manner in which the Contractor intends to proceed with the Project and shall immediately incorporate and reflect the impact of all delays and change orders. All changes made to the schedule shall be subject to approval by the DPMC.

6.3.10 The DPMC will not authorize or approve any claims for additional payment or extension of time for completion of the Work, or any other concession because of any alleged misinterpretation or misunderstanding on the Contractor's part of the Project schedule, the Contractor's failure to attend the pre-bid conference, because of any failure on the Contractor's part to become fully acquainted with all conditions relating to the Project schedule and the manner in which it will be used on the Project, or because of any other failure by the Contractor to properly participate in the development of a progress schedule or to perform the Contract in accordance with the progress schedule.

ARTICLE 7 - TIME OF COMPLETION

7.1 CONTRACT DURATION/NOTICE TO PROCEED

7.1.1 Contract duration shall commence on the effective date set forth on the written Notice to Proceed. The Notice to Proceed will be issued by the DPMC after the DPMC's receipt and acceptance of properly executed Contract Documents, including performance and payment bonds, proof of insurance and permit technical information submitted by the Contractor and/or Subcontractors. The Contractor shall not be entitled to delay, disruption, acceleration or any other claims arising from a deferred issuance of the Notice to Proceed.

7.1.2 The Contractor shall perform no work at the Contract Site prior to the issuance of the Notice to Proceed.

7.2 SUBSTANTIAL COMPLETION

7.2.1 At the request of the Contractor, the Architect/Engineer or the DPMC, the Contractor and the DPMC representative may make a joint inspection of the Work for the purpose of determining if the Work is substantially completed in accordance with the definition provided in Article 1. If DPMC, in its sole discretion, finds that the Work is substantially complete, then the DPMC will issue a written Notice of Substantial Completion for Beneficial Use. Such Notice shall in no way relieve the Contractor of any contractual obligation(s) or relieve the Contractor from responsibility to promptly complete all remaining Contract Work including, but not limited to, punch list items.

7.2.2 The standard guarantee period for equipment, workmanship and materials shall commence on the date DPMC issues the Notification of Substantial Completion for Beneficial Use, or from the time of completion and acceptance of equipment, work or materials in question, whichever is later.

7.2.3 In the event that the Project is completed in phases or stages, and/or in the event that the DPMC takes possession of any part of the Work pursuant to Section 7.4 of these General Conditions, no part of the Project shall be deemed substantially complete for purposes of the New Jersey Statute of Repose, N.J.S.A. 2A:14-1.1, prior to the issuance of a formal Notice of Substantial Completion for Beneficial Use for the all of the Work.

7.3 FINAL COMPLETION

7.3.1 Final completion of the Contract shall occur when:

a. The DPMC and the Architect/Engineer have determined that the punch list has been completed;

b. The Contractor has complied with the Contract Document's closeout requirements;

c. The Contractor has submitted all Contract deliverables as required by the Contract Documents including but not limited to the following: "as-built"

documents, operating and maintenance manuals, attic stock, parts lists, repair source lists, training and certificates; and

d. The Contractor has submitted all warranties, guarantees and/or maintenance bonds required under the Contract.

7.4 PARTIAL OCCUPANCY FOR USE

7.4.1 Use and possession prior to completion: The DPMC shall have the right to take possession or use of any completed or partially completed part of the Project. Said possession or use shall not be deemed acceptance of the Work performed on the Project.

7.4.2 Prior to such possession or use, the DPMC shall furnish the Contractor with an itemized list of Work remaining to be performed or corrected on such portions of the Project that are to be possessed or used by the State. Failure by the DPMC to list any item of work shall not be deemed an acceptance of any Work under the Contract.

7.4.3 The Contractor shall not be entitled to recovery of money damages for any delays, disruptions or inefficiencies caused by such partial occupancy.

7.5 DELAY, DISRUPTION AND INTERFERENCE

7.5.1 Delay - Time Extension. If the Contractor's work is delayed, disrupted or interfered with by act, neglect or default of any party, including the State, the Architect/Engineer, or by strikes, lockouts, fire, unusual delay by common carriers, natural disasters, or by any cause for which the Contractor is not responsible; then for all such delays and suspensions, the Contractor shall be allowed one (1) calendar day addition to the time herein stated for each and every calendar day of such delay so caused in the completion of the Work as specified above, the same to be determined by the DPMC. No such extension shall be granted for any delay unless, within ten (10) calendar days after the beginning of such delay, a written request for additional time shall be filed with the DPMC.

7.5.2 Contractor's Damages for Delay, Disruption or Interference

The Contractor shall not be entitled to recovery of money damages from the DPMC caused by delay, disruption or interference with the Contractor's Work except as expressly provided under section 7.5.2 of these General Conditions paragraph. The Contractor expressly agrees that the Contractor's remedy for delay, disruption of interference shall be limited to an extension of time only and that there shall be no recovery of money damages by the Contractor for any delay, disruption or interference with the Contractor's work attributable to any cause whatsoever (other than the State's negligence, bad faith, active interference or other tortuous conduct). The Contractor expressly agrees that it shall not be entitled to recover damages due to delay, disruption or interference caused by any of the following:

a. Delayed execution of the contract or any of the causes referenced in paragraph 7.5.2;

b. Any act or omission by any party other than the State, including, but not limited to, the Architect-Engineer, any other Contractor or Subcontractor, any

CPM or other consultant retained by the State, any construction manager retained by the State, any agency or instrumentality of the federal government or of any local governmental entity or any utility (e.g., gas, electric, telephone, cable);

c. Any act or omission of any agency or instrumentality of the State , other than the DPMC, including, without limitation, the Department of Environmental Protection and the Department of Community Affairs;

d. Weather;

e. Subsurface conditions of any type including, without limitation rock and underground utilities, whether or not such conditions were reasonably ascertainable to the Contractor at the time of bidding;

f. Use of all or any portion the Project premises prior to completion of the Work to the extent that such use is permitted under the terms of the Contract;

g. Delay in obtaining any permit or approval;

h. Delay caused by the issuance of any court order, injunction or restraining order;

i. Any delay which does not entitle the Contractor to an extension of the Contract Completion Time under Section 6.2.8 of these General Conditions; or

j. Delay attributable to any other cause, other than a cause for which the State is legally restricted from enforcing a contractual "no damage for delay" clause under N.J.S.A. 2A:58B-3 or any other provision of law restricting or barring the enforcement of such clauses.

In interpreting this provision, the negligence or other wrongful conduct of others, including, without limitation, the Architect/Engineer, the CPM consultant, any construction management firm and any other firm or person retained by the State shall not be imputed to the State. Further, to the extent that the Contractor is entitled to recover monetary damages for delay under this Contract, such recovery shall be limited to actual direct costs incurred on account of the delay, and shall not include profit or other markup on such costs, home office overhead calculated under the Eichleay formula or any other kind of consequential or indirect cost or damage, including but not limited to any alleged cost or damage under the total cost method, the modified total cost method, or productivity factors (costs for inefficiency based on industry productivity factors such as those provided by the Mechanical Contractors Association of America (MCAA) Factors Affecting Labor Productivity).

7.5.3 In the event of the failure of the Contractor to complete its work within the time stated in its Contract, the Contractor shall be liable to the State in the sum as set forth as liquidated damages in the Contract, for each and every calendar day that the Contractor fails to attain contract completion of the work. This sum shall be treated as liquidated damages to compensate for the loss to the State of the use of premises in a completed state of construction, alteration or repair, and for added administrative and inspection costs to the State on account of the delay; provided, however, that the said liquidated damages shall be in addition to other compensatory or consequential losses or damages

that the State may incur by reason of such delay, such as, but not limited to, added costs of the Project and the cost of furnishing temporary services, if any. Any such sums for which the Contractor is liable may be deducted by the State from any moneys due or to become due to the Contractor.

7.5.4 It is hereby understood and mutually agreed by and between the Contractor and the State that the start date in the Notice to Proceed, the dates of all required intermediate milestones, and the times for substantial and final completion, as specified in the Contract Documents, are essential conditions of this Contract.

7.5.5 The Contractor agrees that said work shall be executed diligently, at such rate of progress as will ensure full completion of the Work within the time specified. It is expressly understood and agreed, by and between the Contractor and the State, that the time for the completion of the Work herein is a reasonable time, taking into consideration the average climactic range and usual industry conditions prevailing in this locality. If the said Contractor shall neglect, fail or refuse to complete the Work within the time herein specified, or any proper extension thereof granted by the DPMC, then the Contractor does hereby agree, as a part of the consideration for the awarding of its Contract, to pay the State the amount specified in section 7.5.3 above, as liquidated damages for loss of use of the Project as hereinafter set forth, for each and every calendar day that the Contractor may have exceeded the stipulated date in the Contract for substantially completing the Work.

7.5.6 It is further agreed that time is of the essence of each and every portion of this Contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any Work, the new time limit fixed by such extension shall similarly be of the essence.

ARTICLE 8 - CLOSE-OUT

8.1 CLOSE-OUT PROCEDURES/FINAL PAYMENT

As part of the final completion procedures described in Article 7 and the requirements for payment as described in Article 9, the Contractor must complete all of the Close-out procedures as follows:

a. Submit the "as-built" record documents as described in Article 4;

b. Submit all operating and maintenance manuals, parts lists, repair source parts, and certificates as defined in 8.2 below;

c. Provide the necessary training for operating systems and equipment as defined in 8.3 below; and

d. Submit all guarantees as defined in 8.4 below.

8.2 OPERATIONS, EQUIPMENT AND MAINTENANCE MANUALS

8.2.1 The Contractor shall provide six (6) copies of all operating, equipment and maintenance manuals, and applicable warranties, as identified and described in the Contract Documents. The operating, equipment and maintenance manuals and warranties, including contact personnel, addresses and telephone numbers, must include a complete description of all systems and equipment and the method of operating and maintaining the equipment. These manuals must be submitted to the Architect/Engineer for review and approval at the earliest date possible following substantial completion, but in all cases prior to final acceptance. Included within the manuals shall be a list of names, addresses and telephone numbers of all the Subcontractors involved in the installations and of firms capable of performing services for each mechanical item.

8.2.2 As a pre-condition to the Final acceptance of a facility for beneficial use, the Contractor shall provide a "throw-away" copy of operations and maintenance manuals to allow the Using Agency's staff to operate the equipment prior to receiving the hard bound copies required by this Contract.

8.3 TRAINING

The Contractor shall provide formal instruction for DPMC-designated personnel, addressing the operation and maintenance of the facilities and all installed equipment for each operating system or major item of equipment or as otherwise specified. The operations and maintenance manuals shall be used as training materials. Unless otherwise accepted by the DPMC, training course format shall be split equally between classroom instruction and field exercise. All classroom instruction may be videotaped by the DPMC. Classroom instruction may be supported by professionally made videotapes. If used, a copy of each professional video that was utilized shall be provided to the DPMC at no cost for future training and reference.

8.4 GUARANTEE

8.4.1 The issuance of a final certificate for payment and/or partial or complete occupancy of the premises shall not be deemed an acceptance of Work not completed in accordance with the Contract Documents. The issuance of a final certificate for payment and/or partial or complete occupancy of the premises shall not relieve the Contractor or its surety of liability with respect to any express or implied warranties or responsibility for faulty materials or workmanship.

8.4.2 The Contractor shall guarantee and warrant, in writing, the Work performed and all materials furnished under this Contract against defects in materials and/or workmanship The Contractor shall be responsible for the value or repair of any damage to other Work or to the building premises resulting from the performance of the Contract.

8.4.3 The Contractor is responsible for the above-stated obligations for a period of one (1) year from the date established in 7.2.2 above. All guarantees, including bonds and registrations, required by the Contract Documents shall be in writing and delivered to the DPMC with submission of the invoice for final payment.

8.4.4 The Contractor shall, at its own expense and without cost to the State, promptly after receipt of written notice thereof, make good any defects in materials or workmanship which may develop during stipulated guarantee periods, as well as any damage to other Work caused by such defects or by repairs. Any other defects in materials or workmanship not discovered during the guarantee period shall be repaired and/or replaced at the Contractor's expense, and such shall be completed within a reasonable time after written notice is given to the Contractor.

8.4.5 Pursuant to the Contract Documents, certain permanent equipment, including elevators and HVAC systems, will have to be activated during construction of the Project to support construction operations. Despite any early activation during the construction of the Project, any and all equipment warranties must extend for the time periods required in the Contract Documents, starting at the date set forth in paragraph 7.2.2.

8.4.5 It is expressly acknowledged and agreed that the express and implied warranties and guarantees to which the State is entitled as well as all warranty and guarantee bonds issued by any surety, shall be in addition to and not in lieu of the State's right to seek recourse against the Contractor and the Contractor's surety for defective work.

ARTICLE 9 - PAYMENTS

9.1 INVOICES

9.1.1 Requests for payment under the Contract for materials delivered or services rendered require the proper completion and submittal of specific forms including, but not limited to, the following:

a. DPMC Form 11/AR50-1 - DPMC Invoice;

b. DPMC Form 11-2 - Monthly Estimate for Payment to Contractor;

c. DPMC Form 11-2a - Certification of Prime Contractor;

d. DPMC Form 11-2b – Certification of Subcontractor;

e. Copies of Subcontractor(s) invoices;

d. DPMC Form 11-3 - Prime Contractors Summary of Stored Materials;

e. DPMC Form 11-3A - Agreement and Bill of Sale Certification for Stored Materials;

f. Consent of Surety forms;

g. Certified Payroll Records;

h. Updated project schedule

i. Any other information or documentation required by other provisions of the Contract documents.

9.1.3 The Contractor shall submit the completed request for payment on a monthly basis for all properly completed billable work to the DPMC Project representative and at the address identified at the pre-construction conference.

9.1.4 One (1) original and one (1) copy of the request for payment packets shall be prepared and submitted unless otherwise specified.

9.1.2 No request for payment shall be deemed to be formally submitted and received for payment until all dollar amounts and completion percentages for each line item in the invoice has been determined and agreed upon by the State and the Contractor.

9.1.5 For the purpose of the State's Prompt Payment Act (N.J.S.A. 2A:30A-1 et seq.):

a. A proper invoice will be deemed to have been received by the owner when it is received by the person or entity designated by the State to review and sign the invoice on the State's behalf at the address designated in the pre-construction conference for receipt of invoices. Receipt of an invoice by such person or entity shall commence the running of the 20-day period for formal approval and certification as provided under N.J.S.A. 2A:30A-2(a);

b. The "billing date", as the term is used in N.J.S.A. 2A:30A-2, shall be the earlier of the date upon which an invoice for payment is approved for payment or twenty (20) days after the invoice is received, unless within such 20-day period

the invoice is found to be incomplete or otherwise unacceptable and returned to the contractor, with a written explanation of deficiencies;

c. In the event that an invoice is found to be deficient and returned to the contractor, the "billing date" shall be calculated from the date that a corrected invoice is received.

d. Payment shall be considered to have been made on the date on which a check for such payment is dated;

e. Payment terms (e.g., "net 20") offered by the contractor shall not govern the State's obligation to make payment;

f. The following periods of time will not be included in the calculation of the due date of any contractor invoice:

(1) Any time elapsed between receipt of an improper invoice and its return to the contractor, not to exceed twenty (20) calendar days; or

(2) Any time elapsed between the State's return of an improper invoice to the contractor and the State's receipt of a corrected invoice.

9.1.6 The provisions of this Article 9 shall not govern the State's payment obligations nor shall they supersede or modify any other contractual provision allowing the withholding of monies from the contractor to the extent that the contractor has not performed in accordance with the provisions of the contract. Nor shall this Article 9 govern the State's payment obligations nor supersede or modify any other contractual provision governing contractor claims for additional compensation beyond the base contract price and approved change orders.

9.2 INTEREST

9.2.1 Interest shall be payable on amounts due the contractor if not paid within thirty (30) calendar days after the billing date specified in the above subparagraph 9.1.5(b), as provided under the State's Prompt Payment of Contractors and Subcontractors Act (N.J.S.A. 2A:30A-01, et seq.) Interest on amounts due shall be payable to the contractor for the period beginning on the day after the required payment date and ending on the date on which the check for payment is drawn.

9.2.2 Interest may be paid by separate payment to the contractor, but shall be paid within thirty (30) calendar days of payment of the principal amount of the approved invoice.

9.2.3 Nothing in this Article 9 shall be construed as entitling the Contractor to payment of interest on any sum withheld by the State for any reason permitted under the contract or applicable law, or on any claim for additional compensation, over and above sums due under the base contract or approved change orders.

9.3 SCHEDULE OF VALUES AND FINAL PAYMENT

9.3.1 Unless otherwise directed, the Contractor shall furnish a schedule of amounts for Contract payments (Unit Schedule Breakdown,) of the total Contract price, showing the amount included therein for each principal category of the Work and for each Contractor

and Subcontractor, in such detail as requested, to provide a basis for determining progress payments. The schedule, as approved, shall be used only as a basis for the Contractor's estimates for progress payments, and approval by the DPMC does not constitute acceptance of the allocability and allowability of costs to a specific element of Work. The Contractor is cautioned that no payment requests shall be approved until the Unit Schedule Breakdown has been approved in writing by the DPMC.

9.3.2 The State will make progress payments monthly as the Work proceeds based upon the Unit Schedule Breakdown.

9.3.2 All material and Work paid pursuant to progress payments shall thereupon become the sole property of the State. This provision shall not be construed as relieving the Contractor from the sole responsibility for the protection of all material and Work upon which payments have been made for the restoration of any damaged work, or as waiving the right of the State to require the fulfillment of all of the terms and conditions of the Contract.

9.3.3 Following completion and acceptance of all work, the amount due the Contractor under this Contract shall be paid only upon satisfactory completion, by the Contractor, of all Contract close-out requirements, completion of a State audit on all Contract values and payments, and after the Contractor has furnished the State with a release of claims against the State, arising by virtue of this Contract, other than claims in stated amounts as may be specifically excepted by the Contractor from the release.

9.3.4 If for any reason the Contractor refuses final payment, the Project may be closed out by the State by the processing of a Final Contract Acceptance certification. The lack of such certificate shall not toll the limitations period applicable to Contractor claims against the State.

9.3.5 In addition to other warranties required by provisions of the Contract and specifications, the Contractor warrants that title to all Work, materials and equipment covered by an application for payment will pass to the State free and clear of all liens, claims, security interests or encumbrances, either upon incorporation into the construction or upon receipt of payment to the Contractor, whichever occurs first. This provision shall not be construed as relieving the Contractor from sole responsibility for the care and protection of materials and work upon which payments have been made, or for the restoration of any damaged work, or as a waiver by the State of its rights to require fulfillment of all terms of the Contract.

9.3.6 By recommending approval of any invoice, the Architect/Engineer shall not be deemed to represent that it has made exhaustive or continuous on-Site inspections to check the quality or quantity of the Work, or that it has reviewed the construction means, methods, techniques, sequences or procedures, or that it has made any examination to ascertain how and for what purpose the Contractor has used the moneys previously paid. The payment of an invoice does not constitute an acceptance of the Work. The State reserves the right to further inspect the Work and to withhold retainage and any additional funds required to pay for any corrective action for non-conforming work.

9.3.7 If any corporation licensed to do business in New Jersey shall be or become delinquent in the payment of taxes, assessments or fees due the State, unless under an

active appeal process or any final judgment in the State's favor against the Contractor, the DPMC may, in accordance with N.J.S.A. 54:49-19 or other applicable law withhold moneys due the said corporation for the purpose of assuring the payment to the State of such taxes, assessments, fees or judgment.

9.4 CERTIFICATION OF PAYMENTS TO SUBCONTRACTOR

Pursuant to N.J.S.A. 52:32-40, 41 and N.J.S.A. 2A:44-148; the Contractor shall submit a Certification of Prime Contractors form and a Certification of Subcontractor form for each Subcontractor identified in the Unit Schedule Breakdown, as part of the submission for each invoiced progress payment.

9.5 STORED MATERIALS

9.5.1 Unless specifically allowed in the Contract Documents, all materials and equipment must be delivered and installed or stored on the Site prior to payment for such material or equipment.

9.5.2 The DPMC may at its discretion allow payment for equipment stored off Site provided that the following has occurred:

a. The DPMC has approved the Contractor's written request;

b. The equipment has been properly stored in an approved location;

c. The Contractor has established the Owner’s title to the specific equipment;

d. The Contractor has provided sufficient proof of insurance for the materials, equipment and the storage facility;

e. The Contractor has submitted a release of liens on said stored equipment;

f. The Contractor has submitted a statement agreeing to assume all costs for storage of material and equipment off Site, including, if required by the DPMC, the cost of storing such material and equipment in a bonded warehouse; and

g. The Contractor furnishes the "Prime Contractor's Summary of Stored Materials" and "Agreement and Bill of Sale Certification for Stored Materials," forms respectively.

9.6 ALLOWANCES

9.6.1 The Contractor shall include in its bid all allowances as may be set forth in the Contract Documents. The Contractor shall purchase the "allowed materials" as directed by the DPMC on the basis of the lowest acceptable quote from at least three competitive offers or as a negotiated cost subject to DPMC approval. If the actual cost of the "allowed materials" is more or less than the stipulated allowance, the Contract price may be adjusted accordingly. The adjustment in Contract price shall be made on the basis of the actual purchase cost without additional charges for overhead, profit, bond premium or any other incidental expenses. The cost of installation of the "allowed materials," unless

otherwise specified, is to be included as the responsibility of the Contractor in whose Contract the allowance is included, and the Contractor installing such "allowed materials" shall not be entitled to additional payment for such installation.

9.6.2 Unless otherwise provided in the Contract Documents:

a. These allowances shall cover the Contractor's true costs, including credit for any trade discount, of the materials and equipment required by the allowance, delivered at the Site, including all applicable taxes;

b. The Contractor's costs for unloading and handling, labor, installation costs, overhead, profit and other expenses reasonably required in connection with such allowance items shall be included in the Contract sum and not as part of the allowances.

9.7 RETAINAGE

9.7.1 In making progress payments for Contract work completed, the State will retain ten percent (10%) of the approved invoice amount until final acceptance and completion of all work covered by the Contract.

9.7.2 The Contractor may, after 50% (fifty percent) of the Contract work is in place, and if the Work is proceeding on schedule, apply for a reduction in the amount retained by the State for the duration of the Contract. Such application must be in writing and accompanied by documentation granting formal consent of surety to the reduction in retainage request. If the DPMC determines that the Contractor's performance has been satisfactory and that the reduction is warranted and appropriate, the State may, with the next progress payment, release any portion of the accumulated retainage in excess of five percent (5%) of the Work in place and retain an amount equal to five percent (5%) of the Work in place for the duration of the Contract. If progress of the Work is not maintained in accordance with the approved schedule, the DPMC may elect to re-institute retainage of ten percent (10%) of the Work in place for the duration of the Contract.

9.7.3 Withholding Payment for Non-Delivery of Data:

a. If technical data such as "as-built" drawings, reports, spare parts lists, repair parts lists, or instruction books (including additional and maintenance manuals), or any part thereof, are not delivered within the time specified by this Contract or are deficient upon delivery, the DPMC has the discretion to withhold from each invoice a percentage (in addition to any other retainage required by the Contract) of the Contract price in accordance with the following table:

When total contract price is:	Percentage to be withheld is:
Less than $250,000.	10%
$250,000.01 through $1,000,000	5.0%
Over $1,000,000	2.0%

b. The withholding of any sums pursuant to this article shall not be construed as, or constitute in any manner, a waiver by the State of the Contractor's obligation to furnish the data required under this Contract. In the event the

Contractor fails to furnish these items, the State shall have those rights and remedies provided by law and pursuant to this Contract, in addition to, and not in lieu of, the sums withheld in accordance with this article.

9.8 MISCELLANEOUS

9.8.1 Disputes regarding nonpayment of a Contractor's invoice under this Article 9 may be submitted to non-binding Alternative Dispute Resolution (ADR) upon mutual agreement of the State and the Contractor. In such event, the State and the Contractor shall share equally the fees and expenses of the selected mediator, arbitrator, umpire or other ADR neutral. Provided, however, that nothing herein shall be construed, in whole or in part, as a waiver, release or modification of the provisions of the New Jersey Contractual Act, N.J.S.A. 59:13-1, et seq., which governs claims against the DPMC.

9.8.2 A Contractor not paid sums due under an approved invoice within thirty (30) days of the billing date may suspend performance without penalty for breach of contract, but only after providing the State with seven (7) days written notice of non-payment, and only in the event that the State fails to furnish the Contractor, within that seven-day period, a written statement of the amount withheld and the reasons for the withholding. Nothing herein shall be construed to excuse the Contractor's nonperformance, or to limit the State's rights and remedies relating to such non-performance, with regard to any monies withheld from the Contractor upon the proper notice provided under this Article 9, or with regard to any Contractor claim disputed by the DPMC.

ARTICLE 10 - CHANGES IN THE WORK

10.1 CHANGES IN THE WORK

10.1.1 The DPMC may at any time, issue a written Change Order which shall direct a change in the Work within the general scope of the Contract, including, but not limited to, changes:

a. In the plans and/or specifications;

b. In the method or manner of performance of the Work;

c. In the State-furnished facilities, equipment, materials, services, or site; or directing acceleration in the performance of the Work; and/or

d. In the time for the completion of the Work.

10.1.2 Change Orders

10.1.2.1 The Contractor agrees to prepare and submit, within ten (10) calendar days of encountering any conditions it considers a change, or upon receiving official notice of a proposed change or written direction to proceed with a change, a current DPMC form entitled "Contractor Change Order Request," to the DPMC. The Contractor shall submit an original of the form. Failure to submit a timely form may be grounds for rejection of the request for Change Order, at the DPMC's discretion.

10.1.2.2 All requests for Contract time extensions must be submitted in accordance with the requirements set forth in Articles 6 and 7, accompanied by copies of the current approved progress schedule and copies of a proposed progress schedule detailing the incorporation of the changed work and the effects of such incorporation on progress. Failure to provide all required information shall be grounds for rejection of the request.

10.1.2.3 DPMC will only consider a contract duration extension Change Order request arising from changes in the Work, if that change is proven by the Contractor to have caused a delay in the completion of the Project. When the Contract duration is increased as a result of a change, the resulting change in Contract amount will include the costs of extended performance, computed in accordance with the terms of this Section, and no further consideration of such costs arising from the specific modification will be given.

10.1.2.4 Every Change Order request submitted by the Contractor shall furnish a price breakdown, which shall cover all work involved in the change whether such work was deleted, added or changed and shall be in sufficient detail to permit an analysis of all material, labor, equipment, subcontract, overhead costs and profit. Any amount proposed for subcontracts shall be supported by an equally detailed breakdown. In addition, if the request includes a time extension, a justification (see section 10.1.4.) shall also be furnished. The request, together with the price breakdown and time extension justification, shall be furnished by the date specified by the DPMC.

10.1.2.5 The following rates shall apply in computing overhead (indirect costs) and profit for Change Orders that do not exceed $25,000. The percentages shall be applicable for deleted work as well as additional work. When a change consists of both added and

deleted work, the applicable percentages shall be applied to the net cost or credit. In any event, the percentages shall not exceed the following:

a. Overhead will be the sum of:

(1) fifteen percent (15%) of direct labor costs. NOTE: For the purpose of this article, the term "direct labor" shall include all foremen (identified by name and not included in the Project as the full-time superintendent or full time foreman as required elsewhere in the contract documents), equipment operators and skilled, semi-skilled and common laborers directly assigned to the specified operation. The term "direct labor costs" shall consist of the Contract or actual payroll rate of wage per hour and fringe benefits paid for each and every hour that such employees are actually engaged in the performance of the Work.

(2) fifteen percent (15%) of direct material costs. NOTE: For the purpose of this article, the term "direct material costs" shall consist of the actual costs of the materials including applicable tax and transportation charges.

b. For rented equipment, an hourly rental rate will be used which will be determined based upon the monthly rental rates in the current edition of the Rental Rate Blue Book for Construction Equipment (Rental Book)and dividing it by 176. An allowance will be made for operating costs for each and every hour the equipment is actually operating in accordance with the rates listed in the Rental Book. The Contractor will be allowed only 65% (sixty-five percent) of the rental rate on Contractor-owned equipment.

c. Bond premiums and payroll taxes, if applicable, will be allowed at actual cost. The Contractor shall submit from the surety to DPMC a letter for the bond premiums.

d. The Contractor's profit on Subcontractor's work will be six percent (6%) of the Subcontractor's costs. Subcontractor indirect costs will be computed in the same manner as for the Contractor. The Contractor agrees to incorporate this article in each of its subcontracts. NOTE: When more than one tier of Subcontractor exists, for the purpose of markups, they shall be treated as one Subcontractor.

e. A profit of six percent (6%), where profit is allowable by the terms of the applicable Contract provision, shall be added to the Contractor's total cost. Indirect costs shall not be duplicated in direct costs.

10.1.2.6 For Change Orders in excess of $25,000 the maximum allowable percentages of 15% overhead and 6% profit applies unless negotiated lower based upon the nature, extent and complexity of the Work involved.

10.1.2.7 The DPMC, in order to avoid delays in the progress of work or when in the best interests of the State, has the discretion to direct the Contractor, in writing, to proceed with work claimed by the Contractor to be extra work , and/or to accelerate its work without a prior agreement on entitlement or costs. Such direction shall be in the form of a Letter of Direction. The Contractor may submit a claim for evaluation by

DPMC, for costs or for time on account of such work and/or acceleration on the form entitled "Contractor Change Order Request," completed in sufficient detail and in accordance with this article within ten (10) calendar days after receipt of the Letter of Direction. Nothing in this article shall excuse the Contractor from proceeding with the Work identified in the Letter of Direction and all other Contract Work. Issuance of a Letter of Direction under this article shall not be intended nor construed as an admission or acknowledgment by the State that the Contractor is entitled to additional compensation and/or time on account of such Work and/or acceleration.

10.2 ACCELERATION

The DPMC may order and direct the Contractor to accelerate its Work at any location(s) by increasing its forces, working overtime and/or working on Saturdays, Sundays, and holidays. If acceleration is required by the DPMC, and not due to any delays on the part of the Contractor, the Contractor will be reimbursed for additional costs.

ARTICLE 11 - CLAIMS AND DISPUTES

11.1 CONTRACTOR CLAIMS

11.1.1 Any claims made by a Contractor against the DPMC for damages, extra costs or any other claim made pursuant to the contract are governed by and subject to the New Jersey Contractual Liability Act, N.J.S.A. 59:13-1 et seq., as well as all the provisions in this Contract.

11.1.2 Upon presentation by the Contractor of a request in writing, the DPMC may review any decision or determination of the State or the Architect/Engineer as to any claim, dispute or any other matter in question relating to the execution or progress of the Work or the interpretation of the Contract Documents. Consistent with the intent of this Contract, the DPMC may schedule a conference for the purpose of settling or resolving such claims, disputes or other matters. Where such a conference is conducted, the Contractor and/or the Architect/Engineer shall be afforded the opportunity to be heard on the matter in question. Following review of the Contractor's request, the DPMC and the Contractor may settle or resolve the disputed matter, provided however that any such negotiations, conferences, settlement or resolution shall be subject to all requirements imposed by law, including where applicable, the New Jersey Contractual Liability Act (N.J.S.A. 59:13-1 et seq.). The DPMC's participation in any effort to negotiate, settle or resolve any such claim or dispute with the Contractor shall not operate to toll or extend the time limitations for notice or suit under the New Jersey Contractual Liability Act.

11.2 MUTUAL RIGHTS AND RESPONSIBILITIES OF ALL CONTRACTORS AND THE ARCHITECT/ENGINEER

11.2.1 Any Contractor or the Architect/Engineer which by its own acts, errors or omissions, damages or unnecessarily delays the Work or otherwise causes damage to the State, any other Contractor or the Architect/Engineer, shall be directly responsible to the aggrieved party or parties, for all costs and expenses incurred due to any such delays and/or damages whether by settlement, compromise or arbitration or judgment.

11.2.2 Any Contractor damaged by the actions of another Contractor or Architect/Engineer shall have a direct right to recovery against the party causing such damages, but shall not have a right to recover such damages against the State.

11.2.3 In addition, the party responsible for causing such damages agrees to defend, indemnify and save harmless the State from all such claims and damages. Nothing contained in this paragraph shall be construed to relieve the responsible party from any liability or damage sustained on account of such acts, errors or omissions.

11.2.4 The State shall not be held vicariously liable to any Contractor for any damages or extra costs caused by any acts or omissions by another party including but not limited to actions of the Architect/Engineer as specified in the above paragraph. The Contractor's exclusive remedy shall be against the party directly responsible for causing such damages or extra costs.

ARTICLE 12 - TERMINATION/SUSPENSION

12.1 SUSPENSION OF THE WORK / STOP WORK

12.1.1 If the Contractor fails to correct defective work or persistently fails to carry out the Work in accordance with the Contract Documents, or if the DPMC determines that it is in the best interest of the Project to do so, the DPMC may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated and the DPMC provides written notice to the Contractor that the stopped Work may resume.

12.1.2 The DPMC shall have the right to defer the beginning or to suspend the whole or any part of the Work herein contracted to be done whenever, in the opinion of the DPMC, it may be necessary or expedient for the State to do so.

12.2 TERMINATION FOR CAUSE

12.2.1 If the Contractor persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials so as to avoid or eliminate delays in the orderly progress of the Work in accordance with the approved schedule; or if the Contractor fails to make prompt payment to any Subcontractor or for materials or labor; or persistently disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction; or if the Contractor is guilty of a material breach of a provision of the Contract Documents or otherwise fails to carry out the Work in accordance with the Contract Documents, then the DPMC may, without prejudice to any other right or remedy, and after giving the Contractor and its surety three (3) working days written Notice to forthwith address such breach and default with diligence and promptness, terminate the employment of the Contractor by the issuance of a written Notice to that effect to the Contractor and its surety, should the Contractor fail to comply with the demands of the original above mentioned Three Day Notice.

12.2.2 Upon such termination, the DPMC may take possession of the Site and of all the materials, equipment, and tools on the Site and of any materials stored off Site paid for by DPMC, and may finish the Work by whatever method the DPMC may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the Work is finished.

12.2.3 In the event of termination for default, the surety shall either complete the principal's work or finance the completion of the Work. The surety shall not have the right to do nothing. In the event of the surety's breach of its obligations to the State, the surety shall be subject to all available damages under the law, including but not limited to debarment and the penalties imposed by New Jersey's Consumer Fraud Act.

12.2.4 Within seven (7) calendar days following receipt of Notice of Termination by the surety, the surety shall submit in writing its intention to satisfy its bond obligation to the State as obligee, and to explain its plan to complete the Work, tender a completing Contractor or finance the completion of the Work.

12.2.5 If the surety elects to take over the Work and complete same or to tender a completing Contractor, it must furnish notice of its intent to do so in writing over the

signature of an authorized representative and such notice shall be served upon the DPMC within seven (7) calendar days after service upon the surety of the Notice of Termination. This document shall identify the Contractor to perform this work.

12.2.6 If the surety elects to satisfy its bond obligation by financing the completion of the Work, in lieu of taking over same, the surety and State shall enter into an agreement, within thirty (30) days of the termination Notice, setting forth the details of the payments to be made by the surety. All current obligations for labor and materials incurred and outstanding by the defaulting Contractor on this Project shall be paid by the surety without delay, subject to allowance of reasonable time to verify such claims by the surety.

12.2.7 If the surety fails to satisfy its bond obligations within the time frames established above, the DPMC may undertake the completion of the Project in any manner deemed appropriate. In that circumstance, the surety shall not be relieved of any of its payment and performance bond obligations.

12.2.8 If the unpaid balance of the Contract sum exceeds the cost of finishing the Work (including but not limited to liquidated damages for delays and all other remaining damages sustained by the State originating from such breach of Contract), such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor and its surety shall be obligated to pay the difference to the DPMC promptly upon receipt of billing from the State, and this obligation shall survive the termination of the Contract.

12.3 OWNER'S RIGHT TO COMPLETE THE WORK

12.3.1 Alternatively, should the Contractor fail or refuse to correct its breach and default after receiving the required notice as provided under Section 12.2 hereof, the DPMC, in lieu of terminating the Contractor's employment, may provide for the correction and completion of all remaining Work by other means, and deduct all costs associated with such correction and completion from any undisbursed balance of funds (including earned retainage) remaining under the Contract. Such deduction may be documented by issuance of one or more deductive change orders. DPMC's correction or completion of Work under this paragraph shall not operate to waive, release or diminish the liability of the Contractor and its surety to the State for any breach or default by the Contractor.

12.4 TERMINATION FOR CONVENIENCE

12.4.1 The DPMC may, at any time, terminate the Contract in whole or in any part for the DPMC's convenience and without cause when the DPMC in its sole discretion views termination to be in the public interest.

12.4.2 Upon receipt of an order of Termination for Convenience, the Contractor shall not proceed with any item of work which is not specified in the Order of Termination. The Contractor shall complete all items of work specified in the termination order. Such work shall include punch list items and all work necessary to ensure the safety of the public, to properly secure existing work already constructed or partially constructed and to secure the Project Site. This work so ordered shall be performed in accordance with the Contract Documents, and may include items of work not in the original Contract. The Work performed shall be considered substantially complete upon completion and

acceptance of all items of work specified in the Order, except punch list items. After completion of the punch list items and all documents required by the Contract, the Contract shall terminate upon issuance of a Final Certificate and payment. The DPMC reserves the right to declare in default a Contractor who fails to carry out the conditions set forth in an Order of Termination for Convenience.

12.4.3 When the DPMC orders termination of the Contract for Convenience, all completed items of work as of that date will be paid for at the Contract prices.

12.4.3.1Payment for partially completed work will be paid for at agreed prices.

12.4.3.2 Payment for new items, if any, will be made either at agreed prices or in accordance with Article 10.

12.4.3.3Materials obtained by the Contractor for the Work but which have not been incorporated therein may, at the option of the State, be purchased from the Contractor at actual cost delivered to a prescribed location, or otherwise disposed of as mutually agreed.

12.4.4 Within sixty (60) days of the effective termination date, the Contractor shall submit claims for additional costs actually incurred, not covered above or elsewhere in the Contract. Such claims may include reasonable mobilization costs, overhead expenses attributable to the Work performed, Subcontractor costs not otherwise paid for, actual idle labor costs if Work is stopped in advance of the termination date. The DPMC will not compensate the Contractor for costs prohibited under provisions of the Contract and/or anticipated profits on work not performed.

12.4.5 If the DPMC terminates the Contractor for cause as provided under Article 12.2 of the General Conditions, and if a court of law subsequently determines such termination for cause to have been undertaken without lawful justification, then such termination shall be deemed a termination for convenience governed by this Article 12.4. In that event, recovery by the Contractor and/or the Contractor's surety shall be limited to those costs which are recoverable following a termination for convenience under this Article 12.4.

ARTICLE 13 – OTHER REQUIREMENTS

13.1 PREVAILING WAGE

13.1.1 The Contractor shall comply with the New Jersey Prevailing Wage Act Laws of 1963, Chapter 150, (N.J.S.A. 34:11-56.25 et seq.) and all amendments thereto, and this act is hereby made a part of every Contract entered into on behalf of the State of New Jersey through the DPMC, except those Contracts which are not within the contemplation of the Act. Provisions of the Act include the following stipulations and requirements:

a. All workers employed in the performance of every Contract in which the Contract sum is in excess of $2,000 and to which the DPMC is a party shall be paid not less than the prevailing wage rate as designated by the Commissioner, Division of Labor or his or her duly authorized representative.

(1) The Contractor performing public work for the DPMC and which is subject to the provisions of the Prevailing Wage Act, shall post the prevailing wage rates for each craft and classification involved as determined by the Commissioner, Division of Labor. This posting shall include the effective date of any changes thereof, and shall be displayed in prominent and easily accessible places at the Site of the Work or at such place or places as are used by the Contractor/Subcontractor to pay workers' wages.

(2) At the time of the bid due date, the Bidder and any Subcontractors identified by the Bidder must be registered in accordance with "The Public Works Contractor Registration Act" (N.J.S.A. 34:11-56.48 et seq.) All questions regarding registration shall be addressed to:

Contractor Registration Unit
New Jersey Department of Labor
Division of Wage & Hour Compliance
P O Box 389
Trenton NJ 08625-0389
Telephone: 609-292-9464
FAX: 609-633-8591

b. In the event it is found that any worker, employed by any Contractor covered by any Contract in excess of $2,000 for any public work to which the DPMC is a party, has been paid a rate of wages less than the prevailing wage required by such Contract, DPMC may terminate the Contractor's right to proceed with the Work, or such part of the Work as to which there has been failure to pay required wages, and may otherwise execute the Work to completion.

c. In the event that any Subcontractor retained by a Contractor on any Contract in excess of $2,000 for any public work to which the DPMC is a party, has been paid a rate of wages less than the prevailing wage required by such Contract, DPMC may terminate the Contractor's right to proceed with the Work, or such part of the Work as to which there has been failure to pay required wages, and may

otherwise execute the Work to completion or may require that the Contractor immediately substitute a new Subcontractor at the costs set forth in the Contract.

d Nothing contained in the Prevailing Wage Act shall prohibit the payment of more than the prevailing wage rate to any worker employed on a Project.

e. The Contractor shall, as a condition of subcontract with any tier Subcontractor, require compliance with this section as a condition of Subcontract.

f. The State may audit the Contractor's conformance with the Prevailing Wage Act. If the result of such audit determines that the Contractor has not complied with the Prevailing Wage Act then such Contractor shall be responsible for the cost of this audit.

13.2 PATENTS

13.2.1 The Contractor shall hold and save the State and its officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses for or on account of any patented or non-patented design, devise, invention, process, article or appliance manufactured or used in the performance of the Contract, including its use by the State, unless otherwise specifically stipulated in the Contract Documents.

13.2.2 License and/or royalty fees for the use design, devise, invention, process, article or appliance which is authorized by the State must be reasonable, and paid to the holder of the patent or his or her authorized licensee directly by the State and not by or through the Contractor.

13.2.3 If the Contractor uses any design, devise, invention, process, article or appliance covered by letters, patent or copyright, it shall provide for such use by suitable agreement with the State of such patented or copyrighted design, device or material. It is mutually agreed and understood that, without exception, the Contract prices shall include all royalties or costs arising from the use of such design, devise, invention, process, article or appliance in any way involved in the Work.

13.2.4 The Contractor and/or its surety shall indemnify and save harmless the State from any and all claims for infringement by reason of the use of such patented or copyrighted devise, invention, process, article or appliance, or any trademark or copyright in connection with Work performed under this Contract, and shall defend and indemnify the State for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during the execution of the Work or after the completion of the Work. This section shall survive the termination of the Contract.

13.3 RIGHT TO AUDIT

13.3.1 The State reserves the right to audit the records of the Contractor in connection with all matters related to its Contract. The Contractor agrees to maintain its records in accordance with "Generally Accepted Accounting Principles," for a period of not less than five (5) years after receipt of final payment. All charges must be supported by appropriate documentation, including, but not limited to canceled checks. All records

shall be made available to the New Jersey Office of the State Comptroller or other State audit agency upon request and at no cost to the State.

13.3.2 The Contractor shall maintain all documentation related to products, transactions or services under this contract for a period of five years from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller or other State audit agency upon request and at no cost to the State.

13.3.2 The Contractor shall develop, maintain and make available to the DPMC on request such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, Change Orders, all original estimates, takeoffs and other bidding documents, all Subcontractor and supplier Contracts and changes, all records showing all costs and liabilities incurred or to be incurred in connection with the Project (including all Subcontractor and supplier costs), all payment records and all records showing all costs incurred in labor and personnel of any kind, records and other data as the State may request concerning work performed or to be performed under this Contract.

13.3.3 The Contractor acknowledges and agrees that no claim for payment which is premised to any degree upon actual costs of the Contractor shall be recognized or payable by the State except and to the extent that such actual costs are substantiated by records required to be maintained under these provisions.

13.3.4 The Contractor acknowledges and agrees that its obligation to establish, maintain and make available records and the State's right to audit as delineated herein shall extend to actual costs incurred by Subcontractors in performing work required under the Contract Documents. The Contractor shall require in each subcontract that the Subcontractor establish, maintain and make available to the State all records as defined and delineated herein, relating to all work performed under the Subcontractor including work performed by a sub-Subcontractor.

13.4 INSURANCE

13.4.1 Insurance To Be Carried By The Contractor:

The Contractor shall obtain and maintain, at its expense and for the duration of the contract, minimum insurance coverage set forth below. By requiring such minimum insurance, the State of New Jersey shall not be deemed or construed to have assessed the risk that may be applicable to the Contractor under this contract. The Contractor shall assess its own risks and if it deems appropriate and/or prudent, maintain higher limits and/or broader coverage. The Contractor is not relieved of any liability or other obligations assumed or pursuant to the Contract by reason of its failure to obtain or maintain insurance in sufficient amounts, duration or types.

a Commercial General Liability:

(1) Commercial General Liability (CGL)-ISO occurrence form CG001 or a substitute form providing a minimum coverage of $2,000,000 per occurrence for bodily injury liability and $2,000,000 per occurrence for property damage liability and shall cover liability arising from:

- Premises/Operations

- Independent Contractors
- Products/Completed Operations
- Personal and Advertising Injury
- Liability assumed under an insured contract (including defense cost assumed)

(2) The State of New Jersey shall be included as an additional insured under the CGL using ISO additional insured endorsement CG 20 10 and CG 20 37 or a substitute providing equivalent coverage, which endorsement shall include coverage for the State of New Jersey arising out of the completed operations of the contractor, and which coverage shall be maintained in effect for the benefit of the State of New Jersey for a period of three (3) years following the completion of the work specified in section 7.3 of this contract. Additional Insured coverage as required in this subparagraph shall apply as primary insurance with respect to any other insurance or self-insurance programs afforded to the State of New Jersey.

(3) The CGL general aggregate shall apply separately to this project using ISO CG 2503 form – designated construction projects(s) General Aggregate Limit.

(4) There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from explosion, collapse or underground property damage.

(5) If not included in the policy form the CGL policy must be endorsed with a separation of insureds (severability of interests) endorsement.

(6) CGL policy must provide or be endorsed (ISO form CG 24 04) to provide for waiver of subrogation.

b Business Automobile Liability:

(1) Contractor and subcontractors shall maintain business auto liability insurance and such insurance shall cover liability arising out of any auto (including owned, hired and non-owned autos).

(2) The limits of liability shall be not less than $1,000,000 per occurrence for both bodily injury and property damage liability.

(3) Business Automobile coverage shall be written on ISO form CA 00 01 or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage equivalent to that provided in the 1990 and later additions of CA 00 01.

(4) If required by law, the business auto policy shall be endorsed to provide pollution liability coverage equivalent to that provided under the ISO pollution liability broadened coverage for covered autos form

CA 99 48 and the Motor Carrier Act endorsement (MCS 90) shall be attached.

(5) Waiver of Subrogation -- Contractor waives all rights against the State of New Jersey for recovery of damages to the extent these damages are covered by the business auto liability insurance obtained by Contractor pursuant to Paragraph 2.0 of this Agreement.

c Workers Compensation: Workers Compensation Insurance applicable to the laws of the State of New Jersey and other State or Federal jurisdiction is required to protect the employees of the Contractor or any Subcontractor who will be engaged in the performance of this Contract. This insurance shall include employers' liability protection with a limit of liability not less than $500,000.

d Umbrella Liability: Contractor must maintain an Umbrella Liability Policy excess of the Commercial General Liability, Automobile Liability and Employer Liability coverage.

(1) The coverages of the umbrella policy must be as broad as the primary policies covered by this policy and include a "drop-down" provision if the primary coverage becomes impaired or exhausted.

13.4.2 Insurance To Be Carried By The State of New Jersey:

a Builders Risk Insurance: Unless otherwise provided in this agreement the State of New Jersey shall provide and maintain, in a company or companies lawfully authorized to do business in the jurisdiction which this project is located, Builders Risk Insurance in the amount of the initial contract amount as well as subsequent modifications for the entire project at the site on a replacement cost basis.

(1) The Builders Risk coverage shall be on an "All Risk of direct physical loss or damage" or equivalent policy form and include theft, earthquake, flood, temporary structures, demolition and increased cost of construction, architects fees and expenses.

Also the insurance must include coverage for Equipment Breakdown Coverage (a.k.a. Boiler & Machinery) which shall cover insured Equipment during installation and testing. The Builders Risk insurance shall include the interest of the State of New Jersey, the general Contractor, subcontractors and sub-tier contractors in the project.

(2) The Builders Risk Policy shall cover all materials equipment and supplies, assemblies and furnishings intended for specific installation in the project while located at the site. The policy will cover portions of the work off site and portions of the work in transit subject to the policy sub-limits for these coverages.

(3) Waivers of Subrogation -- The State of New Jersey and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees and (2) the

Architect/Engineer, Architect/Engineer's Consultants, and any of their subcontractors, Sub-subcontractors, agents and employees for damages caused by fire or other causes of loss to the extent covered by the Builders Risk insurance or any other property insurance applicable to the work.

(4) The Builders Risk policy will provide for a waiver of subrogation against all interested parties covered by the policy but only to the extent the loss is covered by the policy.

(5) The above insurance shall apply only to the work described in this contract, and shall not apply to alterations, repairs, maintenance and installations of systems, equipment and other items of work which do not result in creating additional habitable space. This insurance shall not protect against damage or loss to any of the Contractor's or Subcontractor's tools, equipment, scaffolding, staging towers or forms and Contractor's materials stored on Site which are not part of the construction Project,. It is understood that the Contractor will, at its own expense, carry all insurance which may be required to provide the necessary protection against such loss or damage herein described which shall contain a waiver of any right of subrogation against the State of New Jersey.

(6) Deductible Provisions -- The insurance protection described herein may contain a deductible clause. The State of New Jersey agrees to bear the cost of all deductibles of the Builders Risk Policy.

(7) Loss Reporting and Loss Adjustment – The Contractor will receive a Loss Reporting Form whenever Builders' Risk Insurance is written. This form includes appropriate loss reporting instructions. In the event of loss, the Contractor shall immediately notify the State of New Jersey, DPMC, in writing, and take any other appropriate steps as may be required under the standard builders' risk insurance policy in effect. Upon the occurrence of any loss or damage prior to the acceptance of the building by the State, the Contractor shall, at the State's option, replace and repair the damaged work as originally provided in the drawings and specifications at no additional compensation to that provided in the original Contract.

(8) Status Trustee for Loss Adjustment -- All losses will be adjusted with, and payable to, the State of New Jersey, as trustee for the insured as their interests may appear. The Contractor shall be named jointly with the State in all policies of insurance, all of which shall be open to inspection by the State.

(9) This provision shall not relieve the Contractor from its obligation to complete, according to plans and specifications, the Project covered by the Contract, and the Contractor and its surety shall be obligated to full performance of the Contractor's undertaking.

13.5 ASSIGNMENT OF ANTITRUST CLAIMS

13.5.1 The Contractor recognizes that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by the ultimate purchaser. Therefore, and as consideration for executing this Contract, the Contractor, acting herein by and through its duly authorized agent, hereby conveys, sells, assigns, and transfers to the State of New Jersey, for itself and on behalf of its political subdivisions, instrumentalities, and public agencies, all right, title and interest to all claims and causes of action it may now or hereafter acquire under the antitrust laws of the United States or the State of New Jersey, relating to the particular goods or services purchased or acquired by the State of New Jersey or any of its political subdivisions or public agencies pursuant to this Contract.

13.5.2 In connection with this assignment, the following are the express obligations of the Contractor:

a. The Contractor will take no action which will in any way diminish the value of the rights conveyed or assigned hereunder.

b. The Contractor will advise the Attorney General of New Jersey and DPMC:

(1) in advance of its intention to commence any action on its own behalf regarding any such claim or cause(s) of action; and/or

(2) immediately upon becoming aware of the fact that an action has been commenced on its behalf by some other person(s) of the tendency of such action.

c. The Contractor will notify the defendants in any antitrust suit of the fact of the within assignment at the earliest practicable opportunity after the Contractor has initiated an action on its own behalf or becomes aware that such an action has been filed on its behalf by another person. A copy of such Notice will be sent to the Attorney General of New Jersey and the DPMC.

13.5.3 It is understood and agreed that in the event any payment under any such claim or cause of action is made to the Contractor, it shall promptly pay over to the State of New Jersey the allotted share thereof, if any, assigned to the State hereunder.

END, GENERAL CONDITIONS

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Contractor's use of site and premises.
4. Work restrictions.
5. Specification and Drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 PROJECT INFORMATION

A. Project Identification: A1349-00 Interior Construction, Renovation and Upgrades

1. Project Location: State Office Building 135 West Hanover Street, Trenton, Mercer County, NJ

B. Owner: New Jersey Division of Property Management & Construction

C. Architect: Lammey + Giorgio Architects, 215 Highland Avenue, Haddon Township, NJ 08108.

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. MEPFP Engineer: Mott MacDonald.

2. Structural Engineer: O'Donnel & Naccarato

3. Vertical Transportation Engineer: Vertical Transportation Excellence

1.5 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. The project consists of the rehabilitation and upgrade to the interior of the The State Office Building that has constructed in approximately 1929. The project includes upgrades to architectural finishes, HVAC, electrical, fire protection, life safety, fire suppression, plumbing, security and elevator systems and other Work indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

C. Project Duration: Substantial Completion is required within 280 consecutive calendar days from receipt of the Notice to Proceed.

1.6 CONTRACTOR'S USE OF SITE AND PREMISES

A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.7 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:

1. Notify Architect Owner not less than three days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.

E. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

F. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office,and in prominent location inbuilt facility. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

    a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    b. Coordinate the addition of trade-specific information to coordination drawingsin a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    f. Indicate required installation sequences.
    g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:

a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

C. Coordination Drawing Process: Prepare coordination drawings in the following manner:

1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.

1.7 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Owner's Project number.
4. Name of Architect.
5. Architect's Project number.
6. Date.
7. Name of Contractor.
8. RFI number, numbered sequentially.
9. RFI subject.
10. Specification Section number and title and related paragraphs, as appropriate.
11. Drawing number and detail references, as appropriate.
12. Field dimensions and conditions, as appropriate.
13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
14. Contractor's signature.
15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.

d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architectof additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log bi-weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number, including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction upon request.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.

4. Digital drawing files will be released to the Contractor upon the return of a completed digital release agreement as prepared by the Architect or Engineer.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Responsibilities and personnel assignments.
b. Tentative construction schedule.
c. Phasing.
d. Critical work sequencing and long lead items.
e. Designation of key personnel and their duties.
f. Lines of communications.
g. Procedures for processing field decisions and Change Orders.
h. Procedures for RFIs.
i. Procedures for testing and inspecting.
j. Procedures for processing Applications for Payment.
k. Distribution of the Contract Documents.
l. Submittal procedures.
m. Preparation of Record Documents.
n. Use of the premises and existing building.

o. Work restrictions.
p. Working hours.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Construction waste management and recycling.
v. Parking availability.
w. Office, work, and storage areas.
x. Equipment deliveries and priorities.
y. First aid.
z. Security.
aa. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.

x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of Record Documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Procedures for completing and archiving web-based Project software site data files.
d. Submittal of written warranties.
e. Requirements for preparing operations and maintenance data.
f. Requirements for delivery of material samples, attic stock, and spare parts.
g. Requirements for demonstration and training.
h. Preparation of Contractor's punch list.
i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
j. Submittal procedures.
k. Owner's partial occupancy requirements.
l. Installation of Owner's furniture, fixtures, and equipment.
m. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Resolution of BIM component conflicts.
        4) Status of submittals.
        5) Status of sustainable design documentation.
        6) Deliveries.
        7) Off-site fabrication.
        8) Access.
        9) Site use.
        10) Temporary facilities and controls.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Status of correction of deficient items.
        14) Field observations.
        15) Status of RFIs.
        16) Status of Proposal Requests.
        17) Pending changes.
        18) Status of Change Orders.
        19) Pending claims and disputes.
        20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Unusual event reports.

B. Related Requirements:
1. Section 014000 "Quality Requirements" for schedule of tests and inspections.
2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file.
2. PDF file.

B. Startup construction schedule.

1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Daily Construction Reports: Submit at weekly intervals.

F. Material Location Reports: Submit at weekly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

H. Unusual Event Reports: Submit at time of unusual event.

I. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including work stages interim milestones.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Use Microsoft Project for current Windows operating system.

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Temporary Facilities: Indicate start and completion dates for the following as applicable:

    a. Securing of approvals and permits required for performance of the Work.
    b. Temporary facilities.
    c. Construction of mock-ups, prototypes and samples.
    d. Owner interfaces and furnishing of items.
    e. Interfaces with Separate Contracts.
    f. Regulatory agency approvals.
    g. Punch list.

3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

    a. <**Insert list of major items or pieces of equipment**>.

4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
6. Commissioning Time: Include no fewer than 15 days for commissioning.
7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
8. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   2. Work Restrictions: Show the effect of the following items on the schedule:

      a. Coordination with existing construction.
      b. Uninterruptible services.
      c. Use-of-premises restrictions.
      d. Provisions for future construction.
      e. Seasonal variations.
      f. Environmental control.

   3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

      a. Subcontract awards.
      b. Submittals.
      c. Purchases.
      d. Mockups.
      e. Fabrication.
      f. Sample testing.
      g. Deliveries.
      h. Installation.
      i. Tests and inspections.
      j. Adjusting.
      k. Curing.
      l. Startup and placement into final use and operation.
      m. Commissioning.

   4. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

      a. Structural completion.
      b. Temporary enclosure and space conditioning.
      c. Permanent space enclosure.
      d. Completion of mechanical installation.
      e. Completion of electrical installation.
      f. Substantial Completion.

E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

   1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

G. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Final Completion percentage for each activity.

H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

I. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.8 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.9 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.

1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.10 CPM SCHEDULE REQUIREMENTS

A. Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within [**14**] <**Insert number**> days of date established for [**commencement of the Work**] [**the Notice to Proceed**] [**the Notice of Award**]. Outline significant construction activities for the first [**90**] <**Insert number**> days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a[**cost- and resource-loaded,**] time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule, so it can be accepted for use no later than [**60**] <**Insert number**> days after date established for [**commencement of the Work**] [**the Notice to Proceed**] [**the Notice of Award**].

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

1.11 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.

9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Concealed Work photographs.
3. Periodic construction photographs.
4. Final Completion construction photographs.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
2. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
3. Section 024119 "Selective Demolition" for photographic documentation before selective demolition operations commence.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.

1. Submit photos on CD-ROM or thumb-drive. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description in file metadata tag:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Architect.
d. Name of Contractor.
e. Date photograph was taken.
f. Description of location, vantage point, and direction.

g. Unique sequential identifier keyed to accompanying key plan.

1.4 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

C. Metadata: Record accurate date and time and GPS location data from camera.

D. File Names: Name media files with date Project area and sequential numbering suffix.

1.6 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs with maximum depth of field and in focus.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag construction limits before taking construction photographs.
2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 20 photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Underground utilities.
2. Underslab services.
3. Piping.

4. Electrical conduit.
5. Waterproofing and weather-resistant barriers.
6. .

E. Periodic Construction Photographs: Take 20 photographs weekly coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take 100 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

G. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Special events planned at Project site.
b. Immediate follow-up when on-site events result in construction damage or losses.
c. Photographs shall be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
d. Substantial Completion of a major phase or component of the Work.
e. Extra record photographs at time of final acceptance.
f. Owner's request for special publicity photographs.

H. running time captured from video recording opposite the corresponding narration segment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
4. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
5. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
6. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
8. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
5. Category and type of submittal.
6. Submittal purpose and description.
7. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
8. Drawing number and detail references, as appropriate.
9. Indication of full or partial submittal.
10. Location(s) where product is to be installed, as appropriate.
11. Other necessary identification.
12. Remarks.
13. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

    a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams that show factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

   a. Project name and submittal number.
   b. Generic description of Sample.
   c. Product name and name of manufacturer.
   d. Sample source.
   e. Number and title of applicable Specification Section.
   f. Specification paragraph number and generic name of each item.
3. .
4. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.

   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests

performed before installation of product. Include written recommendations for substrate preparation and primers required.

2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.8 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.

2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

3.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of [**five**] <**Insert number**> previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.

1. Mockups are used for one or more of the following:

a. Verify selections made under Sample submittals.
b. Demonstrate aesthetic effects.
c. Demonstrate the qualities of products and workmanship.
d. Demonstrate successful installation of interfaces between components and systems.
e. Perform preconstruction testing to determine system performance.

2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect[**or Construction Manager**].

1.4 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

A. Mockup Shop Drawings:

1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Contractor's quality-control personnel.

B. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

E. Reports: Prepare and submit certified written reports and documents as specified.

F. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.

2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.

1. Requirements of authorities having jurisdiction supersede requirements for specialists.

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:

1. Provide test specimens representative of proposed products and construction.
2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
4. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
5. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups when directed unless otherwise indicated.

1.10 QUALITY CONTROL

A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.

    a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

C. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

E. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

F. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

6. Retesting and reinspecting corrected Work.
7. .

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide galvanized-steel bases for supporting posts.

B. Wood Enclosure Fence: Plywood, 8 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.

2.2 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
3. Drinking water and private toilet.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed

construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

D. Storage and Staging: Use designated areas of Project site for storage and staging needs.

E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs, so they are legible at all times.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

H. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.
2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

I. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

G. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Requirements:

1. Section 011000 "Summary" for coordination of, and limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
5. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.

1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

    a. Contractor's superintendent.
    b. Trade supervisor responsible for cutting operations.
    c. Trade supervisor(s) responsible for patching of each type of substrate.
    d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Certified Surveys: Submit two copies signed by professional engineer.

C. Certificates: Submit certificate signed by professional engineer, certifying that location and elevation of improvements comply with requirements.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.6 CLOSEOUT SUBMITTALS

A. Final Property Survey: Submit 5 copies showing the Work performed and record survey data.

1.7 QUALITY ASSURANCE

A. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Plumbing piping systems.
    f. Mechanical systems piping and ducts.
    g. Control systems.
    h. Communication systems.
    i. Fire-detection and -alarm systems.
    j. Conveying systems.
    k. Electrical wiring systems.
    l. Operating systems of special construction.
    m. .

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Sprayed fire-resistive material.
    e. Equipment supports.
    f. Piping, ductwork, vessels, and equipment.
    g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.

B. Engage a professional engineer experienced in laying out the Work, using the following accepted surveying practices:

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.5 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials

specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Restore permanent facilities used during construction to their specified condition.

D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Recycling nonhazardous demolition and construction waste.
   2. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.

C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

D. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

E. Qualification Data: For waste management coordinator and refrigerant recovery technician.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Refrigerant Recovery: Comply with requirements in Section 024119 "Selective Demolition" for refrigerant recovery submittals.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may serve as Waste Management Coordinator.

B. Refrigerant Recovery Technician Qualifications: Comply with requirements in Section 024119 "Selective Demolition."

C. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

D. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

E. Waste Management in Historic Zones or Areas: Transportation equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by [**12 inches**] <**Insert dimension**> or more.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.3 RECYCLING DEMOLITION WASTE

A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 4-inch size.
2. Crush concrete and screen to comply with requirements in Section 312000 "Earth Moving" for use as satisfactory soil for fill or subbase.

B. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 4-inch size.

2. Clean and stack undamaged, whole masonry units on wood pallets.

C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

D. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

E. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

F. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

G. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.

H. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

I. Carpet Tile: Remove debris, trash, and adhesive.

1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

J. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.

K. Conduit: Reduce conduit to straight lengths and store by material and size.

L. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

D. Paint: Seal containers and store by type.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

3.6 ATTACHMENTS

A. Form CWM-1 for construction waste identification.

B. Form CWM-2 for demolition waste identification.

C. Form CWM-3 for construction waste reduction work plan.

D. Form CWM-4 for demolition waste reduction work plan.

E. Form CWM-7 for construction waste reduction progress report.

F. Form CWM-8 for demolition waste reduction progress report.

END OF SECTION 017419

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Requirements:
1. Section 013233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
2. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
3. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest-control inspection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.

5. Submit testing, adjusting, and balancing records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect[**and Construction Manager**] will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.8 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Submit Final Completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection

or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, proceeding from lowest floor to highest floor, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.

1.10 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit by email to Architect.

E. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural

weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
i. Vacuum and mop concrete.
j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
l. Remove labels that are not permanent.
m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
r. Clean strainers.
s. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste-disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.

C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

D. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.

9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.

3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.

5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.

3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

I. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference

Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:
1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.
3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
1. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal:
1) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:
1) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.
2) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an acceptable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Annotated PDF electronic file with comment function enabled.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.

    a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

B. Format: Submit record specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file.

1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.

c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.7 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.

c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

1.8 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.9 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD modewith vibration reduction technology.

1. Submit video recordings on CD-ROM or thumb drive.
2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.

4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. Email address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

FORM CWM-2: DEMOLITION WASTE IDENTIFICATION

SCRIPTION	EST. QUANTITY	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
ving				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Rough Hardware				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				
Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				
Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				
Other:				

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

FORM CWM-4: DEMOLITION WASTE REDUCTION WORK PLAN

ORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						
Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Glazing						
Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panelboards						
Transformers						
Other:						

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

FORM CWM-8: DEMOLITION WASTE REDUCTION PROGRESS REPORT

ORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mechanical Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

* * * * *

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 013233 “Photographic Documentation” for documentation of existing conditions, periodic construction photographs, and final completion.
3. Section 017300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

A. The building will not be occupied but the demolition work shall be performed in a manner so as not to disrupt the Owner’s access to the site.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

1. Existing membrane roof system

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs or video.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 4 hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 075216 Styrene-Butadiene-Styrene Modified Bituminous Membrane Roofing for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 033543 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Polished concrete finishing.
2. Concrete for polished concrete, including concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 033000 "Cast-in-Place Concrete."

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete not designated as polished concrete.

1.3 DEFINITIONS

A. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of polished concrete.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with polished concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Cast-in-place concrete subcontractor.
e. Polished concrete finishing Subcontractor.

2. Review cold- and hot-weather concreting procedures, curing procedures, construction joints, concrete repair procedures, concrete finishing, and protection of polished concrete.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Repair materials.
2. Liquid floor treatments.

1.7 QUALITY ASSURANCE

A. Field Sample Panels: After approval of verification sample and before casting concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 48 by 48 inches minimum, to demonstrate the expected range of finish, color, and appearance variations.

1. Locate panels as indicated or, if not indicated, as directed by Architect.
2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
3. Demolish and remove field sample panels when directed.

B. Mockups: Before casting concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Demonstrate curing, finishing, and protecting of polished concrete.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ARDEX Americas.
b. Euclid Chemical Company (The); an RPM company.
c. PROSOCO, Inc.
d. Or Approved Equal.

PART 3 - EXECUTION

3.1 POLISHING

A. Polish: Level 2: Low sheen, 400 grit.

B. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.

1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
2. Apply reactive stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
3. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
4. Apply penetrating stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
5. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
6. Control and dispose of waste products produced by grinding and polishing operations.
7. Neutralize and clean polished floor surfaces.

END OF SECTION 033543

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Polymer-modified, self-leveling, hydraulic cement underlayment for application below interior floor coverings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Hydraulic cement underlayment.
2. Reinforcement.
3. Primer.
4. Surface sealer.

B. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Test Reports:

1. For fire-resistant ratings, from a qualified testing agency.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place hydraulic cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 HYDRAULIC CEMENT UNDERLAYMENTS

A. Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement product that can be applied in minimum uniform thickness of 1/4 inch and that can be feathered at edges to match adjacent floor elevations.

1. Basis-of-Design Product: Subject to compliance with requirements, provide CTS Cement Manufacturing Corp.; Rapid Set LevelFlor or comparable product by one of the following:
   a. Ardex Americas.
   b. Laticrete International, Inc.
   c. USG Corporation.
   d. Or Approved Equal.

2. Cement Binder: ASTM C150/C150M, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C219.
3. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C109/C109M.
4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F.

D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

E. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test, ASTM F1869: Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 85 percent relative humidity level measurement, or as recommended by hydraulic cement underlayment manufacturer.

C. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond, and prepare surfaces according to manufacturer's written instructions.

D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 INSTALLATION

A. Mix and install underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment installation and for time period after installation recommended in writing by manufacturer.
2. Coordinate installation of components to provide optimum adhesion to substrate and between coats.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Install underlayment to produce uniform, level surface.

1. Install a final layer without aggregate to product surface.
2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during installation and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Apply surface sealer at rate recommended by manufacturer.

G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 INSTALLATION TOLERANCES

A. Finish and measure surface, so gap at any point between gypsum cement underlayment surface and an unleveled, freestanding, 10-foot-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

3.5 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035416

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for ceiling-hung toilet compartments.
2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Slotted channel framing.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Fasteners.
3. Shop primers.
4. Shrinkage-resisting grout.

B. Shop Drawings: Show fabrication and installation details.[**Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.**] Provide Shop Drawings for the following:

1. Steel framing and supports for ceiling-hung toilet compartments.

2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.

1.5 INFORMATIONAL SUBMITTALS

A. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 316L.

D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 316L.

E. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

F. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

G. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches.
2. Material: Cold-rolled steel, ASTM A1008/A1008M, commercial steel, Type B; 0.0677-inch minimum thickness; unfinished.

H. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.

I. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

J. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

K. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening aluminum stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 2.

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

H. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

F. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 METAL LADDERS

A. General:

1. Comply with ANSI A14.3.

2.8 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.9 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items[**not indicated to be galvanized**] unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless primers specified in Section 099600 "High-Performance Coatings" are indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.10 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for ceiling hung toilet partitions securely to, and rigidly brace from, building structure.

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting." Section 099123 "Interior Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for ceiling-hung toilet compartments.
2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Slotted channel framing.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Fasteners.
3. Shop primers.
4. Shrinkage-resisting grout.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for ceiling-hung toilet compartments.

2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.

1.5 INFORMATIONAL SUBMITTALS

A. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 316L.

D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 316L.

E. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

F. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

G. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches.
2. Material: Cold-rolled steel, ASTM A1008/A1008M, commercial steel, Type B; 0.0677-inch minimum thickness; unfinished.

H. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.

I. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

J. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

K. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening aluminum stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 2.

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

H. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

F. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 METAL LADDERS

A. General:

1. Comply with ANSI A14.3.

2.8 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.9 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless primers specified in Section 099600 "High-Performance Coatings" are indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
4. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.10 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for ceiling hung toilet partitions securely to, and rigidly brace from, building structure.

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel railings.
2. Aluminum railings.
3. Aluminum railings with integrated LED lighting.
4. Handrail brackets.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines of mechanically connected railings.
2. Fasteners.
3. Post-installed anchors.
4. Handrail brackets.
5. Shop primer.
6. Intermediate coats and topcoats.
7. Nonshrink, nonmetallic grout.
8. Anchoring cement.
9. Metal finishes.

10. Paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

D. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, including finish.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

a. Show method of connecting and finishingmembers at intersections.

E. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For delegated-design professional engineer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

E. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M, Type 5.

C. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

D. Plates, Shapes, and Bars: ASTM A36/A36M.

2.4 ALUMINUM RAILINGS

A. Basis-of-Design Products: Subject to compliance with requirements, provide Efficient-Tec International, LLC, ANDA Freestanding Rail Design Non-Illuminated or comparable product by one of the following:
   1. Wagner Companies
   2. J.C MacElroy Company, Inc.
   3. Or Approved Equal

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

C. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

D. Extruded Structural Pipe and Round Tubing: ASTM B429/B429M, Alloy 6063-T6.

   1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.

E. Drawn Seamless Tubing: ASTM B210/B210M, Alloy 6063-T832.

F. Plate and Sheet: ASTM B209, Alloy 6061-T6.

G. Die and Hand Forgings: ASTM B247, Alloy 6061-T6.

H. Castings: ASTM B26/B26M, Alloy A356.0-T6.

I. Rail Size: As indicated on drawings.

2.5 ALUMINUM ILLUMINATED RAILINGS

A. Basis-of-Design Products: Subject to compliance with requirements, provide Efficient-Tec International, LLC, ANDA Freestanding Rail Design Illuminated or comparable product by one of the following:
   1. Wagner Companies
   2. Hollaender Manufacturing
   3. Or Approved Equal

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

C. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

D. Extruded Structural Pipe and Round Tubing: ASTM B429/B429M, Alloy 6063-T6.

E. Drawn Seamless Tubing: ASTM B210/B210M, Alloy 6063-T832.

F. Plate and Sheet: ASTM B209, Alloy 6061-T6.

G. Die and Hand Forgings: ASTM B247, Alloy 6061-T6.

H. Castings: ASTM B26/B26M, Alloy A356.0-T6.

I. Rail Size: As indicated on drawings.

J. Light Distribution: Asymmetric.

K. LED Output: Low Output (1.34W/173lm per ft.).

L. Lens Style: Clear with no diffusion (asymmetric).

M. Illumination Color: Linear Warm White 3000K CCT.

N. Driver: Integral.

2.6 FASTENERS

A. Fastener Materials:

1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941, Class Fe/Zn 5 for zinc coating.
2. Aluminum Railing Components: Type 316 stainless steel fasteners.
3. Finish exposed fasteners to match appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:
1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
2. Provide square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.7 MISCELLANEOUS MATERIALS

A. Handrail Brackets: Cast aluminum**,** Ungalvanized-Steel center of handrail 2-1/2 inches from face of railing or wall.

B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. Intermediate Coats and Topcoats: Provide products that comply withSection 099113 "Exterior Painting." Section 099123 "Interior Painting."

F. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.

G. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

H. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.

I. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.8 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water.

1. Provide weep holes where water may accumulate.
2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded or nonwelded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 welds; good appearance, completely sanded joint, some undercutting and pinholes okay

I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection, using an epoxy structural adhesive, if this is manufacturer's standard splicing method.

K. Form changes in direction as follows:
1. By bending or by inserting prefabricated elbow fittings.
2. By bending to smallest radius that will not result in distortion of railing member.

L. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

M. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

Q. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.9 STEEL AND IRON FINISHES

A. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3.

C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with universal shop primer unless zinc-rich primer is indicated.

D. Shop-Painted Finish: Comply withSection 099123 “Interior Painting”.

1. Color: As selected by Architect from manufacturer's full range.

2.10 ALUMINUM FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. High-Performance Organic Finish, Two-Coat Polyvinylidene Fluoride (PVDF): Fluoropolymer finish complying with AAMA 2604 and containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws, using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, attached to post with setscrews.

D. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel railings, weld flanges to post and bolt to metal supporting surfaces.
2. For aluminum railings, attach posts as indicated, using fittings designed and engineered for this purpose.

3.5 ATTACHING RAILINGS

A. Anchor railing ends to concrete and masonry with brackets on underside of rails connected to railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends, using nonwelded connections.

C. Attach handrails to walls with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.6 REPAIR

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

    a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

3.7 CLEANING

A. Cleanaluminum by washing thoroughly with clean water and soap and rinsing with clean water.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055213

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Rooftop equipment bases and support curbs.
   2. Wood blocking and nailers.
   3. Wood furring.
   4. Wood sleepers.
   5. Utility shelving.
   6. Plywood backing panels.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, and the following:

1. Framing for raised platforms.
2. Concealed blocking.
3. Roof framing and blocking.
4. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
5. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.
7. Utility shelving.

B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Utility Shelving: Lumber with 15 percent maximum moisture content of any of the following species and grades:

1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
2. Mixed southern pine or southern pine No. 2 grade; SPIB.
3. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
4. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. Concealed Boards: 15 percent maximum moisture content of any of the following species and grades:

1. Mixed southern pine or southern pine, No. 3 grade; SPIB.
2. Hem-fir or hem-fir (north), Standard or No. 3 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir, Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1,, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

C. Screws for Fastening to Metal Framing: ASTM C1002 ASTM C954, length as recommended by screw manufacturer for material being fastened.

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC193 as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.7 METAL FRAMING ANCHORS

A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Do not splice structural members between supports unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

F. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.

G. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.

2. Use copper naphthenate for items not continuously protected from liquid water.

I. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

J. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 INSTALLATION OF WOOD FURRING

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally and vertically at 24 inches o.c.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 061213 – STRUCTURAL SUBFLOOR PANEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

B. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Framing
   2. Fasteners
   3. Underlayment and floor coverings

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 05 20 00, Metal Joists
B. See Section 06 10 00, Rough Carpentry
C. See Section 09 30 00, Tiling

1.4 REFERENCES

A. ICC-ES AC318 – Acceptance Criteria for Structural Cementitious Floor and Roof Sheathing Panels
B. ICC-ES AC319 – Acceptance Criteria for Horizontal Diaphragms Consisting of Structural Cementitious Floor Sheathing Panels Attached to Cold-Formed Steel Framing
C. ASTM A588/A588M – Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance
D. ANSI/AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural Members
E. ANSI/AISI S210 – North American Specification for Cold-Formed Steel Framing – Floor and Roof System Design
F. ANSI/AISI S214 – North American Specification for Cold-Formed Steel Framing – Truss Design
G. ANSI/AISI S230 – Standard for Cold-Formed Steel Framing – Prescriptive Method for One- and Two-Family Dwellings
H. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
I. ASTM E119 – Standard Test Method for Fire Tests of Building Construction and Materials
J. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C

1.5 SYSTEM REQUIREMENTS

A. Performance Requirements: Fabricate and install systems as indicated:
   1. Floor Framing:
      a. Standard systems:
         i. Floor framing shall be designed with a minimum deflection of L/360, where the Uniform Floor Load is 120 PSF (5.7 kPa) (Allowable) for framing spaced at 24" (610 mm) on center (o.c.).

ii. Floor framing shall be designed with a minimum deflection of L/360, where the Uniform Floor Load is 283 PSF (13.5 kPa) (Allowable) for framing spaced at 16" (406 mm) o.c.

2. Fasteners:
   a. Follow the selected fastener layout for Screw Patterns, for the design Diaphragm Loads as described in the current Progressive Engineering, Inc.'s Evaluation Report PER-13067.
3. Panel Layout:
   a. Follow the 3/4" Structural Panels application described in the current Progressive Engineering, Inc. Evaluation Report PER-13067.

B. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.

C. Noncombustible Ratings: Where noncombustible assemblies are required, provide materials and application procedures identical to those tested according to ASTM E136, "Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 °C.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery:
1. Deliver material to site promptly without undue exposure to weather.
2. Deliver in manufacturer's unopened containers, pallets, or panels fully identified with name, Brand, type, and grade.

B. Storage:
1. Store above ground in dry, ventilated space.
2. Protect materials from soiling, exposure, and damage.
3. If stored outside, material shall be covered with waterproof tarps.
4. Panels must be stored over stable soil or other surface. Soil or surface must be able to carry the load of the stored pallet(s). Each 20-piece pallet weights 3,500 lbs (1542 kg). It is recommended that the load carrying capacity of the floor or surface be verified before storing panels.
5. Pallets must not be stacked out of alignment by more than +/- 1/2" (13 mm), measured on any side of the pallet.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
1. When mechanically fastened, do not install 3/4" Structural Panels when ambient or conditioned temperature is below 0 °F (-18 °C).
2. Prior to the application of finished flooring, 3/4" Structural Panels must be conditioned at the same temperature as required for the finished flooring for at least 48 hours.
3. Do not apply finished flooring over 3/4" Structural Panels when wet, frozen or with surface frost.

1.8 SUBMITTALS

A. Product Data: For each type of Product.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Structural Concrete Panel:
   1. 3/4” Structural Panels, a noncombustible structural subfloor panel manufactured in accordance with Acceptance Criteria AC318.
      a. Panel Dimensions:
         i. Thickness: 3/4"
         ii. Width: 4'
         iii. Lengths: 8'
         iv. Long Edges: Tongue and Groove
      b. Panel Properties:
         i. Density: 75 lb/ft^3 tested in accordance with ASTM C1185
         ii. Weight: 5.0 lbs/ft^2 tested in accordance with ASTM D1037 at a thickness of 3/4” (19 mm)
         iii. Noncombustibility: Pass tested in accordance with ASTM E136
         iv. Surface Burning Characteristics: 0 Flame Spread / 0 Smoke Developed tested in accordance with ASTM E84
         v. Mold Resistance: 10 tested in accordance with ASTM D3273
            0 tested in accordance with G21

B. 3/4” Structural Panels Recommended Fasteners:
   a. In accordance with PER-13067 (Subfloor) and PER-14076 (Roof Deck), PER-15092 (Foundation Wall), and ESR-1792 (Subfloor).
   b. Use only manufacturer recommended fasteners.
   c. Install using the recommended spacing and distance from the Ends (square cut) and Edges (tongue & groove) of the panel.
   d. Any length of recommended fasteners may be used but do not use a larger size fastener unless specified by the structural engineer.

C. Floor Coverings and Underlayment:
   1. Follow floor covering manufacturers’ installation procedures.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

A. Steel framing to receive the 3/4” Structural Panels shall be structurally sound, free from bows, twists, or other malformations and in general compliance with local building code requirements. Damaged framing shall be replaced before installation of 3/4” Structural Panels.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Cold-Formed Steel Framing:
   1. The floor joists and other floor framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
   2. The attachment flange or bearing edge for cold-formed steel must be a minimum 1-5/8" (41 mm) wide, 2” preferred, with at least 3/4" (19 mm) of the panel bearing on the supporting flange.

3. The size of the cold-formed steel framing flange required will vary based on the specified mil thickness/gauge and fastener selected.
4. Cold-formed steel framing thickness and size is always based on diaphragm capacity but must be a minimum 43 mil (18 gauge) and spaced no greater than 24" (610 mm) o.c. for up to 450 plf. When significant diaphragm capacity is required, 54 mil (16 gauge) may be required.
5. Joist bearing shall be provided at the foundation that is uniform and level.
6. Cold-formed steel joists shall be located directly over bearing studs or a header installed at the top of the bearing wall to distribute the load.
7. Joist framing must be perpendicular to rim joists.
8. On steel framing, a web stiffener shall be provided at reaction points and/or concentrated loads as specified in the contract documents. End blocking shall be provided where joist ends are not otherwise restrained from rotation.
9. Additional joists shall be provided under parallel partitions and around all floor openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
10. All blocking or bridging must be installed prior to the installation of 3/4” Structural Panels.
11. Framing must be of good quality, free of bows, twists, or other malformations.

B. Hot-Rolled Steel Framing:
1. The floor joists and other floor framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
2. Framing shape and size is always based on diaphragm capacity.
3. Hot-rolled steel framing shall have a 3” (76 mm) or larger bearing surface suitable for fastener insertion and panels must bear a minimum of 1 1/4” (32 mm) on the framing member.
4. Framing bearing shall be provided at the foundation that is uniform and level.
5. Joist framing must be perpendicular to support beams.
6. Additional framing members shall be provided under parallel partitions and around all floor openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
7. All blocking or bridging must be installed prior to the installation of 3/4” Structural Panels.
8. Framing must be of good quality, free of bows, twists, or other malformations.

C. 3/4” Structural Panels:
1. This product may contain respirable crystalline silica. Refer to OSHA Rule 29 CFR 1926.1153 for specific details about limiting worker exposure to respirable silica.
2. The panels shall be cut to size with a circular saw equipped with carbide-tipped cutting blade and a dry dust industrial HEPA vacuum collection device for control of dust and silica. Wear safety glasses and a NIOSH-approved dust mask when cutting the panel. Collected dust shall be disposed in a safe manner and in compliance with local, state, and federal ordinances.
3. 3/4” Structural Panels shall be installed with the long edges (tongue & groove) perpendicular to the framing. If primary framing direction changes, removal of the tongue from the first row of panels oriented in the new direction will be necessary for proper fastening. Care should be taken to insure sufficient framing flange is available for fastening the panels in the new orientation.
4. The fire, sound, and structural ratings listed for the 3/4” Structural Panel systems are based on fastener attachment only, no adhesives.

5. Begin panel installation by snapping a line across the joists parallel to the rim joist at a distance equal to the width of the first panel being placed. Given that panel width is 48" (1,220 mm), plan the layout so the first and last panel row width is a minimum of 24" (610 mm) wide. In the case where the row width is less than 24" (610 mm) wide, panels shall be blocked on all edges by framing (strapping is not sufficient).
6. Ensure that all supporting members are free of debris before placing panels. Place the cut edge or tongue along the rim joist. Place each panel across three or more supports [minimum two-span condition]. Less than full length panels at the end of a row may span a single framing opening. Cut panels to length as needed to ensure that the butt end of the panel is centered on the framing member. Install panels in a direction that ensures that the butt end falls over the open side of the joist. This will help keep adjacent ends in the same place.
7. 3/4” Structural Panels shall be fastened following the fastening schedule listed in the contract documents. Begin fastening at one end and fan out across the panel. Do not fasten all the corners first. After the installation of one complete row, begin the next row. Slide panels together so that the tongue of the panel being installed fits into the groove of the installed panel. If there is construction debris lodged inside the groove, do not force the tongue into the clogged groove. Clean the plugged groove with a stiff bristle brush to dislodge the trapped debris. Do not gap the panels. Install the second panel and all subsequent panels in a similar manner to complete the row. Install all rows in a running bond pattern so that end joints fall over the center of the framing members and are staggered by at least two supports from where the end joints fall in the adjacent rows. Less than full length panels at the end of a row may be staggered by a single support.
8. Penetrations in the panels should be made before installing the panel whenever possible. If a penetration is required after the panel is installed, set the depth of the saw blade to ensure that the framing is not damaged. Support the ends and edges of any penetrations with framing if they are greater than 6" (153 mm) in any direction.
9. Ensure panel is flush with supporting member, drive fasteners so the heads are flush with the surface of the board.
10. Construction Traffic Protection – prior to floor finishing, place minimum 3/8” (9.525 mm) thick plywood sheathing materials on the floor in high traffic areas over newly installed 3/4” Structural Panels. ¼” plywood may be used in lieu of 3/8” material provided it is fastened at all four corners to prevent shifting and curling. Thicker protecting material may be required if heavier loads are expected or work is to be performed that may damage installed 3/4” Structural Panels.

D. Underlayments

2. Poured Floor Underlayment:
    1) Underlayment can be poured directly onto 3/4” Structural Panels in lieu of a dry underlayment panel.
    2) Underlayment panels should be secured to 3/4” Structural Panels using staples and a modified thin set mortar.
3. Underlayment:
    1) Lay cut edges of Underlayment against the wall; only factory edges should be joined. Begin laying panels at one corner. Maintain 1/4" (6.35 mm) space between panels and perimeter walls. Stagger joints a minimum of 16" (406 mm) so that four panel corners never meet, and offset end and edge joints of panels a minimum of 12" - 16" (305 mm - 406 mm) from subfloor panel joints. Adjoin panel edges and ends lightly together. A maximum 1/32" (0.76 mm) gap is allowed.
    2) The Underlayment must be bonded with modified thin set mortar.
    3) Staples (1/4" (6.35 mm) crown, 43 mil (18 ga.), and 1" (25.4 mm) legs) to be installed at 4" (102 mm) o.c. in the field and 1" (25.4 mm) o.c. along the perimeter of Underlayment panel. Set pneumatic tool pressure to drive fasteners flush or slightly

below underlayment surface. To prevent fastener heads from telegraphing through resilient floor covering, do not countersink more than 1/16" (1.58 mm) below surface.

4) Use patching compound sparingly to fill wide joints, repair any surface voids and correct joint lippage (panel edge sitting above or below the floor plane). Carefully fill joints wider than 1/32" (0.76 mm) and any surface imperfections with only enough material to infill void - do not feather. Correct joint lippage by applying patching compound to low side only and feathering to level. Allow compound to dry completely (90 min. minimum), then lightly sand or scrape, taking care not to scuff panel surface; use a flat blade to scrape away any excess material. Remove dust, dirt, and debris from underlayment surface before application of floor covering.

E. Floor Finish:

1. Leftover material shall be removed from the job site.
2. Remove all foreign material from the floor surface and vacuum all dust from the surface.
4. Before the application of floor finish materials, ensure that all panels are properly fastened, with the fastener head driven flush or slightly below the surface of the panels. If required butt joints and T&G joints shall be filled with an elastomeric patching compound [*cement-based compounds, can crack*].
5. Direct application of bonded floor finishes to 3/4" Structural Panels is not recommended.
6. Engineered Wood – Apply a building paper, No. 15 felt or equivalent, over 3/4" Structural Panels prior to applying wood flooring. For engineered wood flooring, use the moisture barrier recommended for the engineered wood flooring system specified in lieu of the building paper. Follow the wood flooring manufacturer's installation instructions for applying wood flooring to plywood or OSB floor sheathing. 3/4" Structural Panels must be kept dry and maintained in a conditioned space for a minimum of 30 days prior to installation of wood flooring.
7. Ceramic Tile – Ceramic tile should be installed over an underlayment panel or poured underlayment as described in §3.02.D of this specification. Apply ceramic tile in accordance with ceramic tile manufacturer's instructions.
8. Carpet – For residential carpet and pad, apply tackless strips (designed for concrete application) for the installation of stretched carpet. Residential carpet and pad can be installed directly to 3/4" Structural Panels or to an underlayment. For all carpet tile, it is recommended to use an underlayment as described in §3.02.D of this specification.
9. Vinyl Flooring - An appropriate underlayment should be used as described in §3.02.D of this specification.
10. If 3/4" Structural Panels are left bare in extremely-light traffic areas, it is recommended that you seal the panels with a concrete sealer to seal the porous surface.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior standing and running trim.
2. Closet and utility shelving.
3. Wood furring, blocking, shims, and hanging strips for installing interior architectural woodwork items that are not concealed within other construction.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing interior architectural woodwork that are concealed within other construction before interior architectural woodwork installation.
2. Section 062023 "Interior Finish Carpentry" for interior carpentry exposed to view that is not specified in this Section.

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Anchors.
2. Adhesives.
3. Shop finishing materials.

B. Shop Drawings:

1. Include the following:

a. Dimensioned plans, elevations, and sections.

b. Attachment details.

2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.
4. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples: For each exposed product and for each shop-applied color and finish specified.

1. Size:

a. Panel Products: 12 inches by 12 inches.
b. Lumber Products: Not less than 5 inches wide by 24 inches long, for each species and cut, finished on one side and one edge.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For architectural woodwork manufacturer and Installer.

B. Product Certificates: For the following:

1. Composite wood products.
2. Adhesives.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTLAS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.
2. Installer Qualifications: Licensed participant in AWI's Quality Certification Program.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups of typical interior architectural woodwork as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Architectural Woodwork Standards, Section 2.

B. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.

C. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.

B. Environmental Limitations with Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

1.10 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Frames: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.

2.2 ARCHITECTURAL WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide labels and certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.

2.3 FIRE-RETARDANT-TREATED WOOD MATERIALS

A. If fire-retardant materials are required, verify requirements and acceptability of various materials with authorities having jurisdiction. Verify compatibility of fire-retardant treatments with specified finishesFire-Retardant-Treated Wood Materials: Where fire-retardant-treated materials are indicated, use materials complying with requirements that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products in accordance with test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of the Architectural Woodwork Standards. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2. For items indicated to receive a stained, transparent, or natural finish, use organic resin chemical formulation.
3. Mill lumber before treatment, and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Nailers: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

1. Preservative Treatment: Provide softwood lumber treated by pressure process, AWPA U1; Use Category UC3b.

    a. Provide where in contact with concrete or masonry.
    b. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
    c. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
    d. Mark lumber with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee's (ALSC) Board of Review.

2. Fire-Retardant Treatment: Complying with requirements; provide where indicated.

B. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.5 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.

1. Ease edges to radius indicated for the following:

    a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
    b. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.

1. Disassemble components only as necessary for shipment and installation.
2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
3. Notify Architect seven days in advance of the dates and times interior architectural woodwork fabrication will be complete.
4. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.

    a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.

b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.

B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION

A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.

B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.

C. Install interior architectural woodwork level, plumb, true in line, and without distortion.

1. Shim as required with concealed shims.
2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Preservative-Treated Wood: Where cut or drilled in field, treat cut ends and drilled holes in accordance with AWPA M4.

F. Fire-Retardant-Treated Wood: Install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

G. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.

1. Secure with countersunk, concealed fasteners and blind nailing.
2. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with interior architectural woodwork.
3. For shop-finished items, use filler matching finish of items being installed.

H. Standing and Running Trim:

1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
2. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary.
3. Scarf running joints and stagger in adjacent and related members.
4. Fill gaps, if any, between top of base and wall with latex sealant, painted to match wall.
5. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

3.3 FIELD QUALITY CONTROL

A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.

1. Inspection entity shall prepare and submit report of inspection.

3.4 REPAIR

A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects and to result in interior architectural woodwork being in compliance with requirements of Architectural Woodwork Standards for the specified grade.

B. Where not possible to repair, replace defective woodwork.

C. Field Finish: See Section 099123 "Interior Painting" and Section 099300 "Staining and Transparent Finishing" for final finishing of installed interior architectural woodwork not indicated to be shop finished.

3.5 CLEANING

A. Clean interior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION 064023

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 064113 - WOOD-VENEER-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood cabinets for transparent finish.
2. Cabinet hardware and accessories.
3. Wood furring, blocking, shims, and hanging strips for installing architectural cabinets that are not concealed within other construction.
4. Shop finishing.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: For architectural cabinets.

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in architectural cabinets.
5. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples for Initial Selection: For each type of exposed finish.

D. Samples for Verification: For the following:

1. Lumber for Transparent Finish: Not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.
2. Veneer Leaves: Representative of and selected from flitches to be used for transparent-finished cabinets.

3. Corner Pieces:

   a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
   b. Miter joints for standing trim.

4. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Certificates: For each type of product.

C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups of typical architectural cabinets as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

A. Environmental Limitations with Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET MANUFACTURERS

A. Source Limitations: Engage a qualified woodworking firm to assume responsibility for production of architectural cabinets with sequence-matched wood veneers and transparent-finished wood doors that are required to be of same species as architectural cabinets.

2.2 CABINETS, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of architectural cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain requirements that are more stringent than the referenced woodwork quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

2.3 WOOD CABINETS FOR TRANSPARENT FINISH

A. Architectural Woodwork Standards Grade: Custom.

B. Type of Construction: Frameless.

C. Door and Drawer-Front Style: Flush overlay.

D. Wood for Exposed Surfaces:

1. Species: White ash.
2. Cut: Plain sliced/plain sawn.
3. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
4. Matching of Veneer Leaves: Book match.
5. Veneer Matching within Panel Face: Running match.

E. Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.

a. Edges of Thermally Fused Laminate Panel Shelves: PVC or polyester edge banding.

2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
3. Drawer Bottoms: Hardwood plywood.

F. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

G. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

2.4 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
2. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
2. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.5 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response

characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
3. Mill lumber before treatment and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of architectural cabinets.

C. Fire-Retardant Particleboard: Made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Arauco North America.
    b. Timber Products, Inc.
    c. Georgia-Pacific Gypsum LLC.
    d. Or Approved Equal.
2. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
3. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.

D. Fire-Retardant Fiberboard: MDF panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Arauco North America.
    b. Timber Products, Inc.
    c. Roseburg Forest Products.
    d. Or Approved Equal.

2.6 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Julius Blum & Co., Inc.
    b. Knape & Vogt Manufacturing Company.
    c. Grass America.
    d. Or Approved Equal.

B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:

1. Semiconcealed Hinges for Flush Doors: ANSI/BHMA A156.9, B01361.
2. Semiconcealed Hinges for Overlay Doors: ANSI/BHMA A156.9, B01521.

C. Back-Mounted Pulls: ANSI/BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

E. Catches: Magnetic catches, ANSI/BHMA A156.9, B03141.

F. Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081.

G. Shelf Rests: ANSI/BHMA A156.9, B04013; metal.

H. Drawer Slides: ANSI/BHMA A156.9.
1. Heavy-Duty (Grade 1HD-100 and Grade 1HD-200): Side mount.

    a. Type: Full extension.
    b. Material: Zinc-plated ball bearing slides.
    c. Motion Feature: Push to open and Self-closing mechanism.

2. Pencil drawers not more than 3 inches high and not more than 24 inches wide, provide 50 lb load capacity.
3. General purpose drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide 75 lb load capacity.

4. File drawers more than 6 inches high or more than 24 inches wide, provide 100 lb load capacity.

I. Door Locks: ANSI/BHMA A156.11, E07121.

J. Drawer Locks: ANSI/BHMA A156.11, E07041.

K. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.

L. Grommets for Cable Passage: 1-1/4-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Color: Black.

M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: ANSI/BHMA 630.

N. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.7 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.8 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate architectural cabinets to dimensions, profiles, and details indicated. Ease edges and corners to 1/16-inch radius unless otherwise indicated.

C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.9 SHOP FINISHING

A. General: Finish architectural cabinets at manufacturer's shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished items specified to be field finished. See Section 099300 "Staining and Transparent Finishing" for material and application requirements.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural cabinets, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.

D. Transparent Finish:

1. Architectural Woodwork Standards Grade: Same as item to be finished.
2. Finish: System - 5, conversion varnish.
3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
4. Staining: Match approved sample for color.
5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
6. Filled Finish for Open-Grain Woods: After staining, apply wash-coat sealer and allow to dry. Apply paste wood filler and wipe off excess. Tint filler to match stained wood.
7. Sheen: Semigloss, 46-60 gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with cabinet surface.

1. For shop-finished items, use filler matching finish of items being installed.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Maintain veneer sequence matching of cabinets with transparent finish.
4. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

E. Shop Finishes: Touch up finishing after installation of architectural cabinets. Fill nail holes with matching filler.

1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

F. Field Finishing: See Section 099300 "Staining and Transparent Finishing" for finishing of installed architectural cabinets.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces. Touch up finishes to restore damaged or soiled areas.

END OF SECTION 064113

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Mineral-wool blanket insulation.
   2. Mineral-wool board insulation.

B. Related Requirements:
   1. Section 075216 "Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing" for insulation specified as part of roofing construction.
   2. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Mineral-wool blanket insulation.
   2. Mineral-wool board insulation.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MINERAL-WOOL BLANKET INSULATION

A. Mineral-Wool Blanket Insulation, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Owens Corning.
   b. Johns Manville.
   c. ROCKWOOL.
   d. Or Approved Equal.
2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.2 MINERAL-WOOL BOARD INSULATION

A. Mineral-Wool Board Insulation, Type III, Unfaced: ASTM C612, Type III; passing ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Johns Manville; a Berkshire Hathaway company.
   b. Owens Corning.
   c. ROCKWOOL.
   d. Or Approved Equal.
2. Nominal Density: 8 lb/cu. ft..
3. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
4. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.3 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AGM Industries, Inc.
   b. Gemco.

c. GLT Products
d. Or Approved Equal

2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

2.4 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Install insulation with manufacturer's R-value label exposed after insulation is installed.

D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF CAVITY-WALL INSULATION

A. Mineral-Wool Board Insulation: Install insulation fasteners 4 inches from each corner of board insulation, at center of board, and as recommended by manufacturer.

1. Fit courses of insulation between obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

    a. Exterior Walls: Set units with facing placed toward interior of construction.
    b. Interior Walls: Set units with facing placed toward areas of high humidity.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.5 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 075216 – STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Styrene-butadiene-styrene (SBS)-modified bituminous membrane roofing.
2. Roof insulation.
3. Cover board.
4. Walkways.
5. Vapor retarder.

B. Related Requirements:
1. Section 061053 " Miscellaneous Rough Carpentry" wood nailers, curbs, and blocking, and for wood-based, structural-use roof deck panels.
2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings, counterflashings, copings, scuppers and downspouts, and miscellaneous metal components.
3. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.4 PRECONSTRUCTION MEETING

1. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, Construction Manager, Architect, inspecting agency representative, roofing Installer, roofing system manufacturer's representative, HVAC installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

B. Shop Drawings: Include plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation, including slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Crickets, saddles, and tapered edge strips, including slopes.
7. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
8. Tie-in between existing and new roof systems.

C. Samples for Verification: For the following products:

1. Cap Sheet: Samples of manufacturer's standard colors for selection by Architect.
2. Flashing Sheet: Samples of manufacturer's standard colors for selection by Architect.
3. Aggregate surfacing material in gradation and color required.
4. Walkway Pads or Rolls: Samples of manufacturer's standard colors for selection by Architect.

D. Wind Uplift Resistance Submittal: For roofing system indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer Certificates:.

1. Performance Requirement Certificate: Signed by roof membrane manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
   a) Submit evidence of complying with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of membrane roofing system, from ICC-ES

E. Field Test Reports
   1. Fastener-pullout test results and manufacturer's revised requirements for fastener Patterns.

F. Field quality-control reports.

G. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is listed in FM Approvals' RoofNav] for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
   1. Protect stored liquid material from direct sunlight.
   2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.
   1. Store in a dry location.
   2. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Existing Manufacturer warranty #101-020052 for membrane roofing, base flashings, roof insulation, and other components of roofing system is to be maintained.

B. Contractor is responsible for maintaining existing warranty by complying with the following:

   1. A certified Soprema Contractor must perform the work.
   2. Upon completion of the work, the roof must be reinspected by the Soprema technical representative.
   3. A letter must be provided by the Soprema installer giving a full description of the work that was performed on the roof.

C. Installer Warranty: Submit roofing Installer's warranty, signed by Installer, covering Work of this Section, including all components of roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

   1. Warranty Period: One (1) years from date of Substantial Completion. When warranties are required, verify with Owner's counsel that warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.

   a. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

b. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897
1. Roof System Design Pressures: Calculated in accordance with ASCE 7, or applicable standard, for the specified roof system attachment requirements.

2. Approval Rating: FM I-90.

D. Roof Slope: ¼-inch per foot (2%) minimum for roof drainage.

E. Impact Resistance:
1. Performance testing for impact resistance shall be in accordance with FM4450, FM4470, ASTM D3746 or CGSB 37-GP 56M to meet the specified impact resistance requirements.
a. Meets requirements for FM-SH (Severe Hail), ASTM D3746, or CGSB 37-GP 56M.
b. Energy Performance: Roofing system shall have an initial solar reflectance index (SRI) of not less than 81 and an initial thermal emittance of 0.91 when tested according to CRRC-1

F. Exterior Fire-Test Exposure: UL790, ASTM E108, FM4450, or FM4470.

G. Cyclic Fatigue: The roof system shall pass ASTM D5849 Standard Test Method for Evaluating Resistance of Modified Bituminous Roofing Membrane to Cyclic Fatigue (Joint Displacement). Passing results shall show no signs of cracking, splitting or tearing over the joint.

2.2 MANUFACTURER AND ROOF SYSTEMS

A. Basis of Design Manufacturer and Roof System: Soprema “Soprafix”, located at 310 Quadral Drive, Wadsworth, OH 44281; telephone 800-356-3521; 330-334-0066.
1. No substitutions.

2.3 BASE SHEET MATERIALS – ADHERED

A. SBS Modified Bitumen Base Ply: One Ply SOPRALENNE 180 PS 3.0 adhered to cover board with COLPLY membrane adhesive.
1. No substitutions.

2.4 FLASHING BASE PLY, FLASHING CEMENT APPLIED

A. SBS modified bitumen flashing base ply: One ply of SOPRALENE 180 PS 3.0 adhered to the vertical substrates with COLPLY flashing cement.
   1. No substitutions.

2.5 MODIFIED BITUMINOUS CAP SHEET – TORCH APPLIED

A. SBS modified bitumen cap sheet: SOPRALENE FLAM 180 FR GR White heat welded to the flashing base ply.

   1. No substitutions.

2.6 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components

B. Primers: ELASTOCOOL 350. No substitutions.

C. Membrane Adhesives: COLPLY Adhesive. No substitutions.

D. Flashing Cement: COLPLY flashing cement. No substitutions.

E. General Purpose Roofing Cement and Mastic: As manufactured or as recommended by roofing system manufacturer for the intended application and conditions.

F. General Purpose Sealant: As manufactured or as recommended by roofing system manufacturer for the intended application and conditions.

G. Liquid Applied Reinforced Flashing System: As manufactured or as recommended by roofing system manufacturer for the intended application and conditions.

H. Walkway Protection: SOPRAWALK fully adhered with COLPLY adhesive. No substitutions.

2.7 SUBSTRATE BOARDS

A. Cover board: SOPRABOARD; Thickness: 1/4 inch.
   1. Adhered with DUOTACK 365.
   2. No substitutions.

2.8 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO roof membrane manufacturer, and approved for use in FM Approvals' RoofNav-listed roof assemblies.

B. Polyisocyanurate Board Insulation: SOPRA-ISOr as manufactured by Soprema.

   1. No substitutions.

C. Product Data: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces. Insulation must be approved by roofing system manufacturer.

1. Insulation Thickness and R-Value:
   a. Base and top layers; refer to drawings for locations:
      1) 2.5-inches; R = 14.4
      2) 3.5-inches; R = 20.5.

D. Polyisocyanurate Tapered Insulation: SOPRA-ISOr Tapered as manufactured by Soprema.

1. No substitutions.

E. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.
2. Minimum Thickness: 1/4 inch (6.35 mm).
3. Slope:

   a) Roof Field: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.
   b) Saddles and Crickets: 1/2 inch per foot (1:24) unless otherwise indicated on Drawings.

2.9 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Insulation Adhesive: DUOTACK 365 Insulation adhesive.

1. No substitutions.

C. Cover Board: ¼ inch SOPRABOARD adhered to the insulation below using DUOTACK 365 insulation adhesive ribbons.

1. No substitutions.

2.10 VAPOR RETARDER

A. One ply of ELASTOHENE SP 2.2 heat welded to the primed deck.

1. No substitutions.

2.11 FLASHING CAP SHEET, LIQUID-APPLIED

A. SOPREMA ALSAN RS 230 FLASH: Catalyzed polymethyl methacrylate (PMMA) liquid resin with polyester reinforcing fleece fabric fully embedded into the resin to form fully reinforced waterproofing membrane flashings.

1. No substitutions.

B. Product Data

1. VOC Content: <5 g/l.
2. SOPREMA ALSAN RS 230 FLASH: Polymethyl methacrylate (PMMA) liquid resin.
3. SOPREMA ALSAN RS CATALYST POWDER: Reactive agent added to the liquid resin to induce polymerization.
4. SOPREMA ALSAN RS FLEECE: Polyester reinforcement fabric.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.

B. The contractor shall examine all roofing substrates including, but not limited to: insulation materials, roof decks, walls, curbs, rooftop equipment, fixtures, and wood blocking.

C. The applicator shall not begin installation until conditions have been properly examined and determined to be clean, dry and, otherwise satisfactory to receive specified roofing materials.

D. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified roofing system.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PROTECTION AND REMOVALS

A. Protect existing building and site components from damage during and throughout the duration of work. Contractor is responsible to repair any damage to exterior or interior surfaces.

B. Utilize covered chutes to convey debris from the roof to dumpsters. Protect ground and paving to receive dumpsters. Protect canopies, skylight and greenhouse.

C. Do not remove any more roofing that can be replaced in a single work day. Leave the building in a water-tight condition at the end of each work day.

D. Remove all roofing materials down to the existing concrete roof deck. Clean all roofing materials from deck to allow proper fastening. New roof system manufacturer must accept the condition of the existing deck prior to initiating roof installation.

E. Provide night tie-ins between existing and new roofing to assure water-tight conditions.

3.3 PREPARATION

A. Before commencing work each day, the contractor shall prepare all roofing substrates to ensure conditions are satisfactory to proceed with the installation of specified roofing materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.

B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions.

3.4 PRIMER APPLICATION

A. Examine all substrates, and conduct adhesion peel tests as necessary, to ensure satisfactory adhesion is achieved.

B. Apply the appropriate specified primer to dry, compatible substrates as required to enhance adhesion of new specified roofing materials.

C. Apply primer using brush, roller, or sprayer at the rate published on the product data sheet. Lightly prime for uniform coverage, do not apply heavy or thick coats of primer.

D. Asphalt Primer: Apply primer to dry compatible masonry, metal, wood and other required substrates before applying asphalt and heat-welded membrane plies. Primer is optional for solvent based solvent-based SBS adhesives and cements. Refer to product data sheets.

E. Project conditions vary throughout the day. Monitor changing conditions, monitor the drying time of primers, and monitor the adhesion of the membrane plies. Adjust primer and membrane application methods as necessary to achieve the desired results.

3.5 BASE SHEET/VAPOR BARRIER INSTALLATION

A. Follow material product data sheets and published general requirements for installation instructions.

B. Ensure environmental conditions are satisfactory, and will remain satisfactory, during the application.

C. Unroll the sheet onto the roof surface and allow time to relax prior to installation

D. Starting at the low point of the roof, lay out the membrane to ensure the plies are installed perpendicular to the roof slope, shingled to prevent back-water laps.

E. Cut sheet to working lengths and widths as required, conforming to rooftop conditions.

F. Align sheet at side-laps to produce a consistent overlap required for wind uplift resistance approvals.

G. Install in accordance with manufacturer’s recommendations.

3.6 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.

C. Adhered Insulation: Install first layer of insulation to deck with adhesives recommended by manufacturer and approved by FM-Global

1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
2. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.7 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.
3. Trim cover board so that water flow is unrestricted.
4. Cut and fit cover board tight to nailers, projections, and penetrations.
5. Loosely lay cover board over substrate.
6. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:

7. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
8. Install slip sheet over cover board and beneath roof membrane.

3.8 FLASHING

A. The ambient temperature shall be above 50°F (10°C), and the flashing cement temperature shall be a minimum of 70°F (21°C) at the point of membrane application.

B. To ensure the flashing cement is applied at 70°F (21°C), during cold weather, pails shall be stored in heated areas. Pails exposed to cold temperature on the roof shall be provided with heaters when necessary to ensure the minimum application temperature is Maintained

C. Priming substrates is optional when solvent-based membrane adhesives are used. Primer may be applied to reduce adhesive consumption rates for some absorptive substrates.

D. Manufacturer's flashing cement may be applied using ¼ inch notched trowel. Apply 2.0 – 2.5 gallons per square to each surface. Primer may be used to reduce consumption of solvent based flashing cement.

E. Application rates vary based on substrate porosity and roughness.

3.9 SBS MASTIC AND GENERALPURPOSE ROOFING CEMENT APPLICATION

A. Apply manufacturer's general purpose SBS mastic and roofing cement to seal drain leads, metal flanges, seal along membrane edge at terminations, and where specified and required in detail drawings.

B. Do not use general purpose SBS mastics and roofing cement where flashing cement applications are required. Do not use SBS mastics and roofing cement beneath SBS-modified bitumen membrane and flashing plies.

C. Apply general purpose SBS mastic and elastic roofing cement using caulk gun, or notched trowel at 2.0 – 2.5 gallons per square on each surface. Application rates vary based on substrate porosity and roughness. Tool-in as necessary to seal laps 10. Embed matching granules into wet cement where exposed.

3.10 COLD ADHESIVE-APPLIED MEMBRANE APPLICATION

A. Follow material product data sheets and published general requirements for installation instructions.

B. Ensure environmental conditions are satisfactory, and will remain satisfactory, during the application of the membrane adhesive and membrane plies.

C. Unroll membrane onto the roof surface and allow the membrane to relax prior to installing the membrane.

D. Re-roll the membrane in order for the plies to be rolled into the adhesive while ensuring the specified side and end-laps are maintained

E. Starting at the low point of the roof, lay out the membrane to ensure the plies are installed perpendicular to the roof slope, shingled to prevent back-water laps.

F. Cut rolls to working lengths and widths to conform to roof conditions, and lay out to always work to a selvage edge.

G. Ensure all roofing and flashing substrates are prepared as necessary, and all substrates are acceptable to receive the specified adhesive and membrane.

H. Install the specified membrane adhesive ahead of the membrane application. Do not allow the adhesive to skin-over before the membrane is applied into the adhesive. The membrane will not adhere where adhesive has skinned over.

I. Where laps are adhered using membrane adhesive, apply sufficient adhesive coverage to ensure 1/8 to 1/4 in bleed-out is present at all laps.

J. Once set in place, ensure specified side-laps and end-laps are maintained.

K. At end-laps, cut a 45 degree dog-ear away from the selvage edge for all T-joints.

L. For low-slope areas where the roof slope falls below 1/4 in per foot, and where otherwise specified, leave all membrane side and end-laps dry in order to hot-air weld or torch all laps watertight. Embed granules, where present, when heat welding sheets.

M. Use a follow tool, weighted roller or broom the leading edge of the membrane to the substrate, working forward and outward as necessary to remove wrinkles. Avoid walking over the membrane during application.

N. Each day, physically inspect all side and end-laps, and ensure the membrane is sealed watertight. Where necessary, use a torch or hot-air welder and a clean trowel to ensure all laps are fully sealed.

O. Inspect the installation each day to ensure the plies are fully adhered. Repair all voids, wrinkles, open laps and all other deficiencies.

P. Offset cap sheet side and end-laps away from the base ply laps so that cap sheet laps are not located within 18 in of base ply laps.

Q. Immediately broadcast matching granules into adhesive bleed-out at cap sheet laps, or otherwise treat bitumen bleed-out once adhesive has dried and cured.

3.11 FLASHING APPLICATION, HEAT WELDED

A. Refer to SBS manufacturer's membrane application instructions, flashing detail drawings, and follow product data sheets and other published requirements for installation instructions. Refer to manufacturer's membrane flashing detail drawings.

B. The contractor is responsible for project safety. Refer to NRCA CERTA recommendations and building owner requirements for hot work operations.

C. Where required to seal substrates for fire safety, install specified adhered, self-adhered or fastened backer ply to the substrate. Ensure backer-ply covers and seals all substrates requiring protection from exposure to torch operations.

D. Ensure all flashing substrates that require primer are primed, and the primer is fully dry.

E. Unroll the flashing base ply and flashing cap sheet onto the roof surface to their complete length. Once relaxed, cut the membrane to the required working lengths to accommodate the flashing height, cants and the required over-lap onto the horizontal roof surface.

F. Cut the flashing membrane from the end of the roll in order to always install flashings to the side-lap line or selvage edge line.

G. Lay out the flashing base ply and flashing Cap Sheet to offset all side-laps a minimum of 12 inches so that side-laps are never aligned on top of the ply beneath. Shingle the flashing ply laps to prevent back-water laps.

H. Install non-combustible cant strips at transitions where required.

I. Ensure correct membrane and flashing sequencing to achieve redundant, multi-ply, watertight flashings.

3.12 ROOF MEMBRANE BASE PLY INSULATION

A. Before installing flashings, install the roof membrane base ply in the horizontal field of the roof, and extend the base ply up to the top of the cant, where present, at roof terminations, transitions and penetrations.

3.13 FLASHING BASE PLY:

A. Install the flashing base ply starting at the top leading edge of the vertical flashing substrate, down over the cant and onto the horizontal surface of the roof a minimum of 3

inches beyond the of base of the cant onto the roof. Cut the base ply at corners to form 3 inch side-laps. Install gussets to seal corner transitions.

B. Install one or more flashing base ply(s) at all roof terminations, transitions and penetrations.

3.14 ROOF MEMBRANE CAP SHEET:

A. Install the roof membrane Cap Sheet in the horizontal field of the roof over the flashing base ply up to the roof termination, transition or penetration, and up to the top of cants where present.

B. Using a chalk line, mark a line on the membrane cap sheet a minimum of 4 inches from the base of the cant onto the roof. Where granules are present, embed the cap sheet granules using a torch and trowel or granule embedder to prepare the surface to receive the flashing cap sheet.

3.15 FLASHING CAP SHEET:

A. Install the flashing Cap Sheet starting at the top leading edge on the vertical substrate, over the cant and onto the roof surface 4 inches from the base of the cant onto the roof.

B. Install the flashing Cap Sheet to ensure a minimum two (2) ply flashing system is present at all roof terminations, transitions and penetrations.

C. During the membrane and flashing installation, ensure all plies are completely adhered into place, with no bridging, voids or openings. Ensure bitumen or flashing cement bleed-out is present at all flashing side and end-laps.

D. Use a damp sponge float or damp rag to press-in the heat-welded flashing plies during installation.

E. Where sufficient bitumen bleed-out is not present, and for all self-adhered plies, apply specified gun-grade sealant or mastic to seal the membrane termination along all roof terminations, transitions and penetrations. These include gravel stop edge metal, pipe penetrations, along the top edge of curb and wall flashing, and all other flashing terminations where necessary to seal flashings watertight.

F. Fasten the top leading edge of the flashing 8 in on-centers with appropriate 1 in metal cap nails or other specified fasteners and plates. Seal fastener penetrations watertight using specified sealant or mastic.

G. Manufacturer’s liquid-applied, reinforced flashing systems shall be installed where conditions are not favorable to install SBS modified bitumen flashings. Such conditions

include irregular shapes penetrating roof surfaces (I-beams), confined areas and low flashing heights. Manufacturer's liquid-applied, reinforced flashing systems are recommended in lieu of pitch pans and lead pipe flashings.

H. Refer to manufacturer's installation guidelines for FLASHING INSTALLATION.

I. For SBS modified bitumen flashings that are self-adhesive, heat-welded, installed using hot asphalt or SOPREMA COLPLY EF adhesive and/or flashing cement, refer to manufacturer's installation guidelines for SOPREMA ALSAN FLASHING and SOPREMA ALSAN RS.

3.16 APPLIED, PMMA FLASHING SYSTEM LIQUID APPLICATION ALSAN RS 230 FLASH

A. Refer to manufacturer's detail drawings, product data sheets and published general requirements for application rates and specific installation instructions.

B. Pre-cut SOPREMA ALSAN RS FLEECE polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being flashed. Ensure a minimum 2 inch overlap of fleece at side and end-laps. Ensure the completed liquid-applied flashing membrane is fully reinforced.

C. Apply the base coat of catalyzed SOPREMA ALSAN RS resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion.

D. Immediately apply the SOPERMA ALSAN RS FLEECE reinforcing into the wet base coat of resin. Using a brush or roller, work the SOPREMA ALSAN FLEECE reinforcing fabric into the wet resin while applying the second coat of catalyzed SOPREMA ALSAN RS resin to completely encapsulate the fleece.

E. Refer to reinforced, polymethyl-methacrylate, PMMA, and polymethacrylate specification section and application instructions, detail drawings, product data sheets and published general requirements for installation instructions.

3.17 WALKWAYS

A. At areas outlined on the drawings, and around the perimeter of all rooftop equipment and at all door and stair landings, install walkway protection.

B. Cut walkway from end of rolls. No piece shall be less than 24 in.

C. Spot adhere walkway protection with SOPREMA SOPRAMASTIC SP1.

D. Provide a 2 in space between sheets for drainage.

3.18 CLEAN UP

A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

3.19 ROOFING INSTALLER'S WARRANTY

A. Existing roof warranty # 101-020052 is to be maintained. Refer to 1.11 WARRANTY above for requirements for maintaining existing manufacturer roof warranty.

END OF SECTION 075216

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Formed low-slope roof sheet metal fabrications.
2. Formed equipment support flashing.
3. Formed overhead-piping safety pans.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 075216"Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing for materials and installation of sheet metal flashing and trim integral with roofing.
3. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
2. .

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings, shop shall be listed as able to fabricate required details as tested and approved.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof, including apron flashing, termination bar and counterflashing approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with embossed surface.

1. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color: As selected by Architect from manufacturer's full range.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with embossed surface.
1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).

a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
b. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
1) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ATAS International, Inc.
b. Carlisle WIP Products; a brand of Carlisle Construction Materials.
c. Owens Corning.
d. Or Approved Equal.

2. Source Limitations: Obtain underlayment from single source from single manufacturer.
3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams:
   1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

H. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.040 inch thick.
   2. Stainless Steel: 0.0188 inch thick.

B. Counterflashing: Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.
   2. Stainless Steel: 0.0188 inch thick.

C. Flashing Receivers: Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.
   2. Stainless Steel: 0.0156 inch thick.

D. Roof-Penetration Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.0188 inch thick.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.0188 inch thick.
   2.

B. Overhead-Piping Safety Pans: Fabricate from the following materials:
   1. Stainless Steel: 0.0250 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds and sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
7. Do not field cut sheet metal flashing and trim by torch.
8. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.
   a. Form joints to completely conceal sealant.
   b. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
   c. Adjust setting proportionately for installation at higher ambient temperatures.

      1) Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.

1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder aluminum sheet.
3. Do not pretin zinc-tin alloy-coated copper.
4. Do not use torches for soldering.
5. Heat surfaces to receive solder, and flow solder into joint.

   a. Fill joint completely.
   b. Completely remove flux and spatter from exposed surfaces.

6. Stainless Steel Soldering:

   a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
   b. Promptly remove acid-flux residue from metal after tinning and soldering.

c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches over base flashing.
3. Lap counterflashing joints minimum of 4 inches.
4. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 INSTALLATION OF MISCELLANEOUS FLASHING

A. Equipment Support Flashing:

1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
2. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans:

1. Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings.
2. Pipe and install drain line to plumbing waste or drainage system.

3.6 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.8 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 076200

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Preformed flashing sleeves.

B. Related Requirements:

1. Section 055213 "Pipe and Tube Railings" for safety railing systems not attached to roof-hatch curbs.
2. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
3. Section 230548 "Vibration and Seismic Controls for HVAC" for special curbs designed to accommodate seismic and vibration controls.
4. Section 233423 "HVAC Power Ventilators" for power roof-mounted ventilators.
5. Section 237413 "Packaged, Outdoor, Central-Station Air-Handling Units" for standard curbs specified with rooftop units.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

D. Delegated-Design Submittal: For roof curbs and equipment supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design roof curbs and equipment supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind-Restraint Performance: As indicated on Drawings.

2.2 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
   a. Greenheck Fan Corporation.
   b. Kingspan Light + Air LLC.
   c. Thybar Corporation.
   d. Or Approved Equal.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.

D. Material: Zinc-coated (galvanized) steel sheet, 0.064 inch thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As selected by Architect from manufacturer's full range.

E. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
3. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.

4. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange or by use of leveler frame.
5. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
6. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
7. Liner: Same material as curb, of manufacturer's standard thickness and finish.
8. Nailer: Factory-installed wood nailer under top flange on side of curb, continuous around curb perimeter.
9. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
10. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch-thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
11. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.
12. Damper Tray: Provide damper tray or shelf with opening 3 inches less than interior curb dimensions indicated.

2.3 PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches high, with removable metal hood and slotted metal collar.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Custom Solution Roof and Metal Products, a division of Colony Heating.
    b. Menzies Metal Products.
    c. Thaler Metal Industries Ltd.
    d. Or Approved Equal.

2. Metal: Aluminum sheet, 0.063 inch thick.
3. Diameter: As indicated on Drawings.
4. Finish: Manufacturer's standard.

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Custom Solution Roof and Metal Products, a division of Colony Heating.
    b. Menzies Metal Products.
    c. Thaler Metal Industries, Ltd.
    d. Or Approved Equal.

2. Metal: Aluminum sheet, 0.063 inch thick.
3. Height: 13 inches.
4. Diameter: As indicated on Drawings.

5. Finish: Manufacturer's standard.

2.4 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 coating designation and mill phosphatized for field painting where indicated.
   1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

      a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.

B. Aluminum Sheet: ASTM B209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
   1. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

      a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.
   2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

2.5 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Polyisocyanurate Board Insulation: ASTM C1289, thickness and thermal resistivity as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Underlayment:

   1. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
   2. Polyethylene Sheet: 6-mil-thick polyethylene sheet complying with ASTM D4397.
   3. Slip Sheet: Building paper, 3 lb/100 sq. ft. minimum, rosin sized.
   4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified

asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.

2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb Installation: Install each roof curb so top surface is level.

D. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.

E. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A780/A780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 078100 - APPLIED FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sprayed fire-resistive materials.

1.3 DEFINITIONS

A. SFRM: Sprayed fire-resistive materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Sprayed fire-resistive material.
2. Substrate primers.
3. Bonding agent.
4. Metal lath.
5. Reinforcing fabric.
6. Reinforcing mesh.
7. Sealer.
8. Topcoat.

B. Shop Drawings: Framing plans or schedules, or both, indicating the following:

1. Extent of fire protection for each construction and fire-resistance rating.
2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.

3. Minimum sprayed fire-resistive material thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
4. Treatment of sprayed fire-resistive material after application.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions in size.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Certificates: For each type of sprayed fire-resistive material.

C. Evaluation Reports: For sprayed fire-resistive material, from ICC-ES.

D. Preconstruction Test Reports: For fire protection.

E. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.

1. Build mockup of each type of fire protection and different substrate as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on field mockups of fire protection.

1. Field Mockup: 24 inches by 48 inches.
2. Provide test specimens and assemblies representative of proposed materials and construction.

B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.

1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
2. Density: Test for density according to ASTM E605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with sprayed fire-resistive material.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, obtain sprayed fire-resistive material manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fire protection when ambient or substrate temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fire protection, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fire protection dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fire protection, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fire protection for each fire-resistance design from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

A. Sprayed Fire-Resistive Material UL-J709: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carboline Company; a subsidiary of RPM International.
b. GCP Applied Technologies Inc.
c. Isolatek International.
d. Southwest Fireproofing Products Co.
e. Or Approved Equal.

2. Bond Strength: Minimum 150-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E736.
3. Density: Not less than density specified in the approved fire-resistance design, according to ASTM E605.
4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E605, whichever is thicker, but not less than 0.75 inch.
5. Combustion Characteristics: ASTM E136.
6. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 10 or less.
b. Smoke-Developed Index: 10 or less.

7. Compressive Strength: Minimum 10 lbf/sq. in. according to ASTM E761.
8. Corrosion Resistance: No evidence of corrosion according to ASTM E937.
9. Deflection: No cracking, spalling, or delamination according to ASTM E759.
10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E760.
11. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours according to ASTM E859.

2.3 AUXILIARY MATERIALS

A. Provide auxiliary materials that are compatible with sprayed fire-resistive material and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by sprayed fire-resistive material manufacturer and complying with one or both of the following requirements:

1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Primer's bond strength in required fire-resistance design complies with specified bond strength for sprayed fire-resistive material and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E736.

C. Bonding Agent: Product approved by sprayed fire-resistive material manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and sprayed fire-resistive material

manufacturer's written instructions. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.

E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by sprayed fire-resistive material manufacturer.

F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by sprayed fire-resistive material manufacturer. Include pins and attachment.

G. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by sprayed fire-resistive material manufacturer for each fire-resistance design.

H. Topcoat: Suitable for application over sprayed fire-resistive material; of type recommended in writing by sprayed fire-resistive material manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.

1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fire protection with substrates under conditions of normal use or fire exposure.
2. Verify that objects penetrating fire protection, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Verify that substrates receiving fire protection are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fire protection application.

B. Verify that concrete work on steel deck is complete before beginning Work.

C. Verify that roof construction, installation of rooftop HVAC equipment, and other related work are complete before beginning Work.

D. Conduct tests according to sprayed fire-resistive material manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.

E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire protection materials during application.

B. Clean substrates of substances that could impair bond of fire protection.

C. Prime substrates where included in fire-resistance design and where recommended in writing by sprayed fire-resistive material manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fire protection.

3.3 APPLICATION

A. Construct fire protection assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fire protection Work.

B. Comply with sprayed fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fire protection; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fire protection with other construction to minimize need to cut or remove fire protection.

1. Do not begin applying fire protection until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fire protection until application of fire protection is completed.

D. Metal Decks:

1. Do not apply fire protection to underside of metal deck substrates until concrete topping, if any, is completed.
2. Do not apply fire protection to underside of metal roof deck until roofing is completed; prohibit roof traffic during application and drying of fire protection.

E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and sprayed fire-resistive material manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by sprayed fire-resistive material manufacturer.

F. Spray apply fire protection to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by sprayed fire-resistive material manufacturer.

G. Extend fire protection in full thickness over entire area of each substrate to be protected.

H. Install body of fire protection in a single course unless otherwise recommended in writing by sprayed fire-resistive material manufacturer.

I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fire protection that differs in color from that of encapsulant over which it is applied.

J. Where sealers are used, apply products that are tinted to differentiate them from fire protection over which they are applied.

K. Provide a uniform finish complying with description indicated for each type of fire protection material and matching finish approved for required mockups.

L. Cure fire protection according to sprayed fire-resistive material manufacturer's written instructions.

M. Do not install enclosing or concealing construction until after fire protection has been applied, inspected, and tested and corrections have been made to deficient applications.

N. Finishes: Where indicated, apply fire protection to produce the following finishes:

1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
2. Spray-Textured Finish: Finish left as spray applied with no further treatment.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Test and inspect as required by the IBC, Subsection 1705.13, "Sprayed Fire-Resistant Materials."

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fire protection for the next area until test results for previously completed applications of fire protection show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fire protection will be considered defective if it does not pass tests and inspections.

1. Remove and replace fire protection that does not pass tests and inspections, and retest.
2. Apply additional fire protection, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

3.6 PROTECTION

A. Protect fire protection, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fire protection is without damage or deterioration at time of Substantial Completion.

3.7 REPAIRS

A. As installation of other construction proceeds, inspect fire protection and repair damaged areas and fire protection removed due to work of other trades.

B. Repair fire protection damaged by other work before concealing it with other construction.

C. Repair fire protection by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078100

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 078123 - INTUMESCENT FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Mastic and intumescent fire-resistive coatings.

B. Related Requirements:

1. Section 078100 "Applied Fire Protection" for sprayed fire-resistive materials (SFRM).

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Mastic and intumescent fire-resistive coatings.
2. Substrate primers.
3. Reinforcing fabric.
4. Reinforcing mesh.
5. Topcoat.

B. Shop Drawings: Framing plans or schedules, or both, indicating the following:

1. Extent of fire protection for each construction and fire-resistance rating.
2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
3. Minimum mastic and intumescent fire-resistive coating thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
4. Treatment of mastic and intumescent fire-resistive coating after application.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions in size.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of mastic and intumescent fire-resistive coating.

C. Evaluation Reports: For mastic and intumescent fire-resistive coating, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by mastic and intumescent fire-resistive coating manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of each type of fire protection and different substrate and each required finish as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fire protection when ambient or substrate temperature is 50 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fire protection, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fire protection dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fire protection, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fire protection for each fire-resistance design from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

A. Mastic and Intumescent Fire-Resistive Coating: Manufacturer's standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat, and complying with indicated fire-resistance design.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hilti, Inc.
   b. Sherwin-Williams Company (The)
   c. Isolatek International
   d. Or Approved Equal
2. Application: Designated for "interior general purpose" and "conditioned interior space purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
4. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 50 or less.
5. Finish: As selected by Architect from manufacturer's standard finishes.

   a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 AUXILIARY MATERIALS

A. Provide auxiliary materials that are compatible with mastic and intumescent fire-resistive coating and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by mastic and intumescent fire-resistive coating manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by mastic and intumescent fire-resistive coating manufacturer.

D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by mastic and intumescent fire-resistive coating manufacturer. Include pins and attachment.

E. Topcoat: Suitable for application over mastic and intumescent fire-resistive coating; of type recommended in writing by mastic and intumescent fire-resistive coating manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.

1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fire protection with substrates under conditions of normal use or fire exposure.
2. Verify that objects penetrating fire protection, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Verify that substrates receiving fire protection are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fire protection application.

B. Conduct tests according to mastic and intumescent fire-resistive coating manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire protection materials during application.

B. Clean substrates of substances that could impair bond of fire protection.

C. Prime substrates where included in fire-resistance design and where recommended in writing by mastic and intumescent fire-resistive coating manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fire protection.

D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fire protection. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fire protection assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fire protection Work.

B. Comply with mastic and intumescent fire-resistive coating manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fire protection; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fire protection with other construction to minimize need to cut or remove fire protection.

1. Do not begin applying fire protection until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fire protection until application of fire protection is completed.

D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and mastic and intumescent fire-resistive coating manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by mastic and intumescent fire-resistive coating manufacturer.

E. Spray apply fire protection to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by mastic and intumescent fire-resistive coating manufacturer.

F. Extend fire protection in full thickness over entire area of each substrate to be protected.

G. Install body of fire protection in a single course unless otherwise recommended in writing by mastic and intumescent fire-resistive coating manufacturer.

H. Provide a uniform finish complying with description indicated for each type of fire protection material and matching finish approved for required mockups.

I. Cure fire protection according to mastic and intumescent fire-resistive coating manufacturer's written instructions.

J. Do not install enclosing or concealing construction until after fire protection has been applied, inspected, and tested and corrections have been made to deficient applications.

K. Finishes: Where indicated, apply fire protection to produce the following finishes:

1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Test and inspect as required by the IBC, Subsection 1705.14, "Mastic and Intumescent Fire-Resistant Coatings."

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fire protection for the next area until test results for previously completed applications of fire protection show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fire protection will be considered defective if it does not pass tests and inspections.

1. Remove and replace fire protection that does not pass tests and inspections, and retest.
2. Apply additional fire protection, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

3.6 PROTECTION

A. Protect fire protection, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fire protection is without damage or deterioration at time of Substantial Completion.

3.7 REPAIRS

A. As installation of other construction proceeds, inspect fire protection and repair damaged areas and fire protection removed due to work of other trades.

B. Repair fire protection damaged by other work before concealing it with other construction.

C. Repair fire protection by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078123

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetration firestopping systems for the following applications:

a. Penetrations in fire-resistance-rated walls.
b. Penetrations in horizontal assemblies.
c. Penetrations in smoke barriers.

B. Related Requirements:

1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 ALLOWANCES

A. Penetration firestopping Work is part of an allowance.

1.4 UNIT PRICES

A. Work of this Section is affected by unit prices.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.8 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.11 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 3M Fire Protection Products.
b. Hilti, Inc.
c. Tremco Incorporated.
d. Or Approved Equal.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Collars.
3. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

E. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

F. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

G. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 FIRE RATED DUCT WRAP INSULATION

A. Manufactuers: Subject to compliance with requirements, provide products by one of the following:

1. Thermal Ceramics.
2. Unifrax.
3. 3M Fire Protection Products.

4. Or Approved Equal.

B. Product:

1. Nominal 1.5 inch thick foil encapsulated blanket material at 6 PCF to provide 2-hour fire resistive enclosure assembly per ASTM E 2336.
2. A lightweight, flexible, inorganic, non-asbestos, bio-soluble, high temperature, foil encapsulated blanket wrap.
3. Flexible, fully encapsulated blanket material, two-layer system to provide 2-hour fire resistive enclosure assembly per ASTM E 2336.
4. Blanket insulation shall maintain a 2012 degree F (1100 degree C) operating temperature.
5. Blanket fiber materials shall be tested per UL regulatory requirements.
6. Provide firestop sealants, tape, insulation pins, clips, banding and other components as per manufacturer's instructions to provide fully functioning zero clearance to combustibles grease duct system.

C. Performance: Lightweight, non-asbestos, bio-soluble, high temperature, inorganic, foil encapsulated insulation blanket. The blanket material shall be capable of performing at 2000 degree F (1093 degree C) matching the internal and external fire test temperature for grease ducts. The duct wrap system shall be a tested and listed system evaluated for reduced clearances to combustibles as an alternative to a grease duct, with a two-hour fire rated shaft enclosure. Testing shall be conducted at a nationally recognized testing laboratory

1. Performance requirements:
   a. Two-layer system of 1-1/2 inch 6 pcf material.
   b. Zero clearance to combustibles across the entire surface of the blanket material per internal fire tests of ASTM E 2336.
   c. 2-hour fire resistive enclosure assembly per ASTM E 119.
   d. Firestop tested per ASTM E 814, 2 Hour F and T Ratings.
   e. Meets 25/50 flame and smoke ratings per ASTM E 84.

2.5 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

    a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

        1) UL in its "Fire Resistance Directory."

2.2 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Hilti, Inc.
    b. 3M Fire Protection Products.
    c. Tremco Incorporated.
    d. Or Approved Equal.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Hilti, Inc.
    b. 3M Fire Protection Products.
    c. Tremco Incorporated.
    d. Or Approved Equal.

2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.

D. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

E. Accessories: Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing joint firestopping systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

END OF SECTION 078443

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Latex joint sealants.

B. Related Requirements:
1. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Joint-sealants.
2. Joint sealant backing materials.

B. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

    a. Joint-sealant location and designation.
    b. Manufacturer and product name.
    c. Type of substrate material.
    d. Proposed test.
    e. Number of samples required.

2. Preconstruction Laboratory Test Reports: For each joint sealant and substrate material to be tested from sealant manufacturer, indicating the following:

    a. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
    b. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

3. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

B. Field Quality-Control Submittals:

1. Field-Adhesion-Test Reports: For each sealant application tested.

C. Sample warranties.

1.6 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Authorized representative who is trained and approved by manufacturer.
2. Testing Agency: Qualified in accordance with ASTM C1021 to conduct the testing indicated.

1.8 MOCKUPS

A. Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
6. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants in accordance with Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.10 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.11 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Pecora Corporation.
b. Sherwin-Williams Company (The).
c. The Dow Chemical Company.
d. Or Approved Equal.

B. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Pecora Corporation.
b. The Dow Chemical Company.
c. Tremco.
d. Or Approved Equal.

2.4 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Pecora Corporation.
b. Sherwin-Williams Company (The).
c. Tremco Incorporated.
d. Or Approved Equal.

2.5 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Adfast.
b. Alcot Plastics Ltd.
c. Construction Foam Products; a division of Nomaco, Inc.
d. Master Builders Solutions.
e. Or Approved Equal.

B. Cylindrical Sealant Backings: ASTM C1330, Type O (open-cell material), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Exterior insulation and finish systems.
    e. .

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.
    e. .

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

a. Extent of Testing: Test completed and cured sealant joints as follows:

1) Perform 10 tests for the first 1000 ft. of joint length for each kind of sealant and joint substrate.
2) Perform one test for each 1000 ft. of joint length thereafter or one test per each floor per elevation.

b. Test Method: Test joint sealants in accordance with Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

c. Inspect tested joints and report on the following:

1) Whether sealants filled joint cavities and are free of voids.
2) Whether sealant dimensions and configurations comply with specified requirements.

3) Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

d. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

e. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

2. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

C. Prepare test and inspection reports.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Interior joints in horizontal traffic surfaces:

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in stone flooring.
c. Control and expansion joints in brick flooring.
d. Control and expansion joints in tile flooring.
e. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, S, NS, 50, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement:

1. Joint Locations:

a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 079219 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Acoustical joint sealants.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Acoustical joint sealants.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants, showing full range of available colors for each product exposed to view.

C. Samples for Verification: For each type and color of acoustical joint sealant required.

1. Size: 1/2-inch-wide sealant joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Acoustical Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Product Test Reports: For each type of acoustical joint sealant, for tests performed by qualified testing agency.

B. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.6 WARRANTY

A. Installer's Special Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Manufacturer's Special Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACOUSTICAL JOINT SEALANTS

A. Acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies in accordance with ASTM E90.

B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hilti, Inc.
b. Pecora Corporation.
c. Tremco Incorporated.
d. USG Corporation.
e. Or Approved Equal.

2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by acoustical joint-sealant manufacturer where required for adhesion of sealant to joint substrates.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where recommended by acoustical joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written instructions for closing off sound-

flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079219

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
4. Division 08 Section "Door Hardware".
5. Division 09 Section "Interior Painting" for field painting hollow metal doors and frames.
6. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access control system.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.

10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Steelcraft (S).
4. Or Approved Equal.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

2. Core Construction: Manufacturer's standard polyurethane. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 3.2 or better.
3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

2. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
3. Vertical Edges: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.
2. Curries Company (CU) - Polyurethane Core - 707 Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
   1. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
   2. Manufacturers Basis of Design:

      a. Curries Company (CU) – M Series.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

   1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
   2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
   3. Manufacturers Basis of Design:

      a. Curries Company (CU) - C Series.
      b. Curries Company (CU) - M Series.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
   2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
   3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator’s shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld joints continuously through full throat width of frames, including rabbets, soffits, and stops; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

4. Equal Rabbet Frames: Provide frames with equal rabbet dimensions unless glazing and removable stops require wider dimensions on glass side of frame.
5. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
6. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
7. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
8. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
9. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".

    a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
    b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
    c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
    d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.

10. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
11. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

12. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
13. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Five-ply flush wood veneer-faced doors for transparent finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:
1. Section 088000 "Glazing" for glass view panels in flush wood doors.
2. Section 088813 “Fire-Rated Glazing” for fire-rated glass view panels in flush wood doors.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door trim for openings.
5. Factory-machining criteria.
6. Factory- finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door and frame location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.

4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.
6. Dimensions and locations of mortises and holes for hardware.
7. Clearances and undercuts.
8. Requirements for veneer matching.
9. Doors to be factory finished and application requirements.
10. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Field quality-control reports.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Special warranties.

B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.7 QUALITY ASSURANCE

A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

C. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons, and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

B. Environmental Limitations: Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of veneer.
b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.
   1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.3 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with ANSI/WDMA I.S. 1A.

   1. Provide labels and certificates from AWI certification program indicating that doors comply with requirements of grades specified.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORSFOR TRANSPARENT FINISH

A. Interior Doors:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. VT Industries.
      b. OSHKOSH Door Company.
      c. Haley Bros. Inc.
      d. Or Approved Equal.
   2. Performance Grade: ANSI/WDMA I.S. 1A Standard Duty.
   3. Performance Grade:

      a. ANSI/WDMA I.S. 1A Heavy Duty unless otherwise indicated on Drawings.
      b. ANSI/WDMA I.S. 1A Extra Heavy Duty: public toilets janitor's closets assembly spaces exits and offices.

   4. ANSI/WDMA I.S. 1A Grade: Custom.
   5. Faces: Single-ply wood veneer not less than 1/50 inch thick.

a. Species: Select white maple.
b. Cut: Rotary cut.
c. Match between Veneer Leaves: Book match.
d. Assembly of Veneer Leaves on Door Faces: Running match.
e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
f. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling.

6. Exposed Vertical Edges: Same species as faces - Architectural Woodwork Standards edge Type A.

   a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
   b. Fire-Rated Pairs of Doors: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
      1) Finish steel edges and astragals to match door hardware (locksets or exit devices).

   c. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

      1) Screw-Holding Capability: 550 lbf in accordance with WDMA T.M. 10.

7. Core for Non-Fire-Rated Doors:

   a. ANSI A208.1, Grade LD-2 particleboard.

      1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

      2) Provide doors with glued-wood-stave or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087100 "Door Hardware."

   b. Glued wood stave.
   c. WDMA I.S. 10 structural composite lumber.

      1) Screw Withdrawal, Door Face: 550 lbf.
      2) Screw Withdrawal, Vertical Door Edge: 550 lbf.

   d. Either glued wood stave or WDMA I.S. 10 structural composite lumber.

8. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.

a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.

9. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.
2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

6. Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
7. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing" and Section 088813 “Fire-Rated Glazing.”

2.6 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Factory finish doors that are indicated on Drawings to receive transparent finish.

C. Transparent Finish:

1. ANSI/WDMA I.S. 1A Grade: Custom.
2. Finish: ANSI/WDMA I.S. 1A TR-4 Conversion Varnish.
3. Finish: ANSI/WDMA I.S. 1A TR-6 Catalyzed Polyurethane.
4. Finish: ANSI/WDMA I.S. 1A TR-8 UV Cured Acrylated Polyester/Urethane
5. Staining: As selected by Architect from manufacturer's full range.
6. Effect: Filled finish.
7. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Install frames level, plumb, true, and straight.

1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
2. Anchor frames to anchors or blocking built in or directly attached to substrates.

a. Secure with countersunk, concealed fasteners and blind nailing.
b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1) For factory-finished items, use filler matching finish of items being installed.

3. Install fire-rated doors and frames in accordance with NFPA 80.
4. Install smoke- and draft-control doors in accordance with NFPA 105.

D. Job-Fitted Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated below.

a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.

2. Machine doors for hardware.
3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
4. Clearances:

    a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
    b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
    c. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
    d. Comply with NFPA 80 for fire-rated doors.

5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

1. Provide inspection of installed Work through AWI's Quality Certification Program, certifying that wood doors and frames, including installation, comply with requirements of AWI/AWMCA/WI's "Architectural Woodwork Standards" for the specified grade.
2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
3. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Access doors and frames.
2. Fire-rated access doors and frames.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.

C. Product Schedule: For access doors and frames.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing and inspecting agency.

1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
2. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

1.5 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

1.6 QUALITY ASSURANCE

A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies meets the qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection[**and temperature-rise limit**] ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Nystrom, Inc.
   b. Acudor Products, Inc.
   c. Babcock-Davis
   d. Or Approved Equal.
2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
3. Optional Features: Piano hinges.
4. Locations: Ceiling.
5. Door Size: As indicated on Drawings.
6. Cold-Rolled Steel Sheet:
   a. Door Material: Nominal 0.075 inch, 14 gauge.
   b. Frame Material: Nominal 0.062 inch, 16 gauge. Provide 1/4-inch mounting holes.
   c. Finish: Paintable, White, powder-coat.
7. Latch and Lock: Cam latch, hex-head wrench operated.

2.3 FIRE-RATED ACCESS DOORS AND FRAMES

A. Fire-Rated, Flush Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Nystrom, Inc.
   b. Acudor Products, Inc.
   c. Babcock-Davis

d. Or Approved Equal.

2. Description: Door face flush with frame, uninsulated; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
3. Optional Features: Piano hinges [.
4. Locations: Wall and ceiling.
5. Door Size: As indicated on drawings.
6. Fire-Resistance Rating: Not less than that of adjacent construction.
7. Temperature-Rise Rating: 250 deg F at the end of 30 minutes.
8. Cold-Rolled Steel Sheet:
   a. Door Material: Nominal 0.036 inch, 20 gauge.
   b. Frame Material: Nominal 0.062 inch, 16 gauge.
   c. Finish: Paintable white, powder coat.
9. Latch and Lock: Self-closing, self-latching door hardware, operated by knurled-knob.

2.4 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Aluminum Extrusions: ASTM B221, Alloy 6063.

E. Aluminum Sheet: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

F. Frame Anchors: Same material as door face.

G. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.5 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.

D. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.

E. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finished: Apply manufacturer's powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil for topcoat.

a. Color: As selected by Architect from full range of industry colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

1. Fire-Rated Door Inspections: Inspect each fire-rated access door in accordance with NFPA 80, Section 5.2.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated access door indicating compliance with each item listed in NFPA 80.

3.4 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 084226 - ALL-GLASS ENTRANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Interior glass partition.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.

B. Shop Drawings: For all-glass entrances.

   1. Include plans, elevations, and sections.
   2. Include details of fittings and glazing.
   3. Door hardware locations, mounting heights, and installation requirements.

C. Samples for Verification: For each type of exposed finish indicated, prepared on Samples of size indicated below.

   1. Metal Finishes: 6-inch-long sections of, accessory fittings, and other items.
   2. Glass: 6 inches square, showing exposed-edge finish.

D. Delegated-Design Submittal: For all-glass systems indicated to comply with performance requirements and design criteria.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For all-glass systems to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

A. Warranty: Manufacturer agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Deflection Limits: Deflection normal to glazing plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller.

B. Seismic Performance: All-glass entrances shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. Identification of Safety Glazing: Each pane of safety glazing installed in hazardous locations shall be identified by a manufacturer’s designation specifying who applied the designation, the manufacturer or installer and the safety glazing standard with which it complies with. The designation shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that once applied, cannot be removed without being destroyed.

E. STC Rating: 47.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Avanti Systems, Inc.; Solare™ acoustic, double-glazed partition system or comparable product by one of the following:

1. DORMA USA, Inc.
2. Nana Wall Systems, Inc.
3. Transwall Systems, Inc.
4. Or Approved Equal.

2.3 METAL COMPONENTS

A. Perimeter Framing Members: Manufacturer’s extruded or formed aluminum framing members of thickness required.

1. Aluminum: ASTM B221, 6063-T6 alloy and temper.
2. Finish: Powder Coat, Black

B. Anchors and Fastenings: Concealed.

2.4 GLASS

A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency or bubble, or lose physical and mechanical properties after fabrication and installation.

1. Thickness: 9/16 inch
2. Location: Inner pane.
3. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
4. Interlayer thickness: 1/16 inch.
5. Interlayer color: Clear unless otherwise noted.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), tested for surface and edge compression per ASTM C 1048 and for impact strength per 16 CFR 1201 for Category II materials.

1. Class 1: Clear monolithic

    a. Thickness: 1/2 inch.
    b. Locations: Outer pane.

2. Exposed Edges: Machine ground and flat polished.
3. Butt Edges: Flat ground.
4. Corner Edges: Lap-joint corners with exposed edges polished.

2.5 GLAZING SEALANTS

A. General:
   1. Compatibility: Compatible with one another and with other materials they contact, including glass products, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturer's written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer’s full range of industry colors.

B. Neutral-Curing Silicone Glazing Sealant, Class 50: Complying with ASTM C920, Type S, Grade NS, Use NT.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Pecora Corporation.
      b. The Dow Chemical Company.
      c. Tremco Incorporated.
      d. Or Approved Equal.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

2.7 FABRICATION

A. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.

   1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.

B. Factory assemble components and factory install hardware and fittings to greatest extent possible.

C. Form or extrude aluminum shapes before finishing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install all-glass systems and associated components according to manufacturer's written instructions.

B. Set units level, plumb, and true to line, with uniform joints.

C. Maintain uniform clearances between adjacent components.

D. Lubricate hardware and other moving parts according to manufacturer's written instructions.

E. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.

3.3 ADJUSTING AND CLEANING

A. Adjust all-glass entrance doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.

1. For all-glass entrance doors accessible to people with disabilities, adjust closers to provide a three-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

B. Remove excess sealant and glazing compounds and dirt from surfaces.

END OF SECTION 084226

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 085123.23 - COLD-ROLLED STEEL WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-Rated Cold-rolled steel windows.

B. Related Requirements:
1. Section 088813 "Fire-Rated Glazing" for fire-rated glass in steel windows.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements for cold-rolled steel windows, including, but not limited to, the following:

a. Coordinating finishing of cold-rolled steel windows with other work where color and finish matching is indicated.
b. Coordinating cold-rolled steel windows with other exterior wall components, including anchorage, glazing, flashing, weeping, air barriers, sealants, and protection of finishes.
c. Sequencing work to construct a watertight and weathertight exterior building enclosure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.

B. Shop Drawings:

1. Plans, elevations, sections, and details.
2. Detail attachments to other work, and between units, if any.
3. Hardware and required clearances.

4. Mullion details, including reinforcement and stiffeners.
5. Munton details.
6. Flashing details.
7. Glazing details.
8. Accessories.

C. Samples for Verification: Actual sample of finished products for each type of cold-rolled steel window including weather stripping, glazing bead, and hardware.

1. Size: Manufacturers' standard size.

D. Product Schedule: For cold-rolled steel windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Product Test Reports: For each cold-rolled steel window, for tests performed by a qualified testing agency.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

C. Qualification Statements: For manufacturer and testing agency.

D. Sample warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cold-rolled steel windows.

B. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturers: A manufacturer capable of fabricating cold-rolled steel windows that meets performance requirements indicated and of documenting performance by labels, test reports, and calculations.
2. Installers: Authorized representative who is trained and approved by manufacturer.

1.8 MOCKUPS

A. Build mockups to verify selections made under Sample submittals and to set quality standards for fabrication and installation.
   1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

A. Contractor is to verify all field conditions and measurements prior to fabrication.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of cold-rolled steel windows that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:
      a. Deterioration of metals, metal finishes, and other materials beyond normal weathering use.
      b. .

   2. Warranty Period:

      a. Window: Three years from date of Substantial Completion.
      b. Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Optimum Window Mfg Corporation, FR7650TSH series, or comparable product by one of the following:
   1. Fyre-Tec.
   2. Hope’s Windows, Inc.
   3. Or Approved Equal.

2.2 SOURCE LIMITATIONS

A. Obtain cold-rolled steel windows from single source from single manufacturer.

2.3 PERFORMANCE REQUIREMENTS

A. SWI Standards: Comply with applicable requirements in SWI's "Architect's Guide to Steel Windows and Doors" and "Specifications - Formed Cold Rolled Sections," except where more stringent requirements are indicated.

B. Structural Wind Loads: As indicated on Drawings.

C. Deflection Limits: Design glass framing system to limit deflection of glass edges in a direction perpendicular to glass plane to less than 1/175 of glass-edge length for each individual glazing light or 3/4 inch, whichever is less, at design pressures.

D. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, cold-rolled steel windows do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Air Leakage for Weather-Stripped Sash: Not more than 0.37 cfm/ft. of sash crack length at a differential pressure across the windows of 6.24 lbf/sq. ft. when tested in accordance with ASTM E283/E283M.

F. Water Penetration for Weather-Stripped Sash: No leakage for 15 minutes when window is subjected to a rate of flow of 5 gal./h/sq. ft. with a differential pressure across the window of 2.86 lbf/sq. ft. when tested in accordance with ASTM E331.

G. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.36 Btu/sq. ft. x h x deg F.

H. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.70.

I. Condensation Resistance: Provide cold-rolled steel windows with a CR of 33 minimum, determined in accordance with NFRC 500.

J. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F material surfaces.

K. Windborne-Debris-Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 1 for basic protection.

L. Fire-Test-Response Characteristics: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.

2.4 COLD-ROLLED STEEL WINDOWS

A. Types: Provide the following window types in locations indicated on Drawings:
   1. Hung: Single.

B. Cold-Rolled Steel Windows: Provide frame and sash members mechanically formed from metallic-coated, low-carbon, cold-rolled steel sheet complying with ASTM A653/A653M. Comply with SWI specifications for combined weight of frame and sash members and front-to-back depth of frame or sash members.

   1. Thermally Broken Design: Provide frame and sash members designed to isolate interior and exterior surfaces for improved thermal performance.

C. Window Finish: Baked enamel or powder coat.

   1. Color: As selected by Architect from manufacturer's full range.

D. Mullions: Formed of cold-rolled steel matching window units; with anchors for support to structure and for installation of window units and having sufficient strength to withstand design pressure indicated. Provide mullions of profile indicated and with cover plates. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections.

E. Muntins: Cold-rolled steel T-shaped sections fully welded to perimeter frame with cross notched intersections.

F. Glazing Stops: Provide snap-on glazing stops; coordinate with Section 088813 "Fire-Rated Glazing" and with glazing system indicated. Provide glazing stops to match panel frames. Finish glazing stops to match window units if fabricated of steel; otherwise, provide manufacturer's standard finish.

G. Weather Stripping: Manufacturer's standard compressible weather stripping, complying with AAMA 701/702, ASTM C509, or ASTM C864 and designed for permanently resilient sealing under compression and for complete concealment when sash is closed.

2.5 GLAZING

A. Glass and Glazing System: See Section 088813 "Fire-Rated Glazing" for glass units and glazing requirements for cold-rolled steel windows.

2.6 HARDWARE

A. General: Provide manufacturer's standard, die-cast-metal hardware, with operating components of stainless steel, carbon steel complying with AAMA 907, brass, bronze, or other corrosion-resistant material designed to smoothly operate, tightly close, and securely lock cold-rolled steel window sash; and sized to accommodate sash weight and dimensions.

B. Self-Closing Device for Fire-Rated Windows: Manufacturer's standard heat-activated fusible link self-closing device, complying with NFPA 80.

C. Hung Window Hardware:

1. Balances:

a. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.

2. Locks and Latches:

a. Type: Spring activated catches and sweep locks with keepers.

1) Style: As selected by Architect from manufacturer's full range of styles.

3. Handles:

a. Type: Lift handle; one per sash.

1) Style: Manufacturer's standard.

2.7 INSECT SCREENS

A. Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, fully integrated with window. Locate screens on outside of window and provide for each operable exterior sash. Comply with SMA 1201.

B. Aluminum Screen Frames: Manufacturer's standard extruded-aluminum or formed-tubular-aluminum members; with mitered, coped joints, or corner extrusions; concealed fasteners; adjustable rollers; and removable PVC or PE spline/anchor concealing edge of mesh.

1. Frame Wall Thickness: 0.04 inch minimum.
2. Finish:
   a. High-performance organic finish in color selected by the Architect from manufacturer's full range.

C. Aluminum Wire Fabric: 18-by-16 count per sq. in. mesh of 0.011-inch-diameter, coated aluminum wire.

1. Wire-Fabric Finish: Black.

2.8 ACCESSORIES

A. Fasteners: Provide fasteners of bronze, brass, stainless steel, or other metal that are warranted by manufacturer to be noncorrosive and compatible with trim, hardware, anchors, and other components of cold-rolled steel windows.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

B. Anchors, Clips, and Window Accessories: Provide units of stainless steel, hot-dip zinc-coated steel, bronze, brass, or iron complying with ASTM A123/A123M. Provide units with sufficient strength to withstand design pressure indicated.

1. Windborne-Debris-Impact Resistance: Provide anchors and clips of same design used to pass windborne-debris-impact-resistance testing.

C. Sealant: For sealants required within fabricated windows, provide manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.9 FABRICATION

A. Fabricate cold-rolled steel windows of type and in sizes indicated to comply with SWI standards. Include a complete system for assembly of components and anchorage of window units.

B. Provide units that are reglazable without dismantling framing.

C. Subframes and Operable Sash: Formed of cold-rolled steel of profile indicated. Miter or cope corners, and mechanically fasten and seal joints or weld and dress joints smooth.

D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

E. Provide weep holes and internal water passages to conduct infiltrating water to the exterior.

2.10 METALLIC-COATED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.

B. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the organic coating to be applied over it.

C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough-opening dimensions, levelness of sill plate and clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF COLD-ROLLED STEEL WINDOWS

A. SWI Publication: Comply with applicable requirements in SWI's "Guidelines on How to Install Steel Windows," except where more stringent requirements are indicated.

B. Comply with manufacturer's written instructions for installing windows, hardware, operators, accessories, and other components.

C. Windborne-Debris-Impact Resistance: Anchor cold-rolled steel windows required to have windborne-debris resistance to structure using method, anchor type, and anchor spacing identical to that used in windborne-debris-impact-resistance testing.

D. Install windows level, plumb, square, true to line, without distortion or impediment to thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

E. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.

F. Install windows and components to drain condensation, water-penetrating joints, and moisture migrating within windows to the exterior.

G. Separate corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E2112.

H. Install windows in accordance with NFPA 80.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Test windows for air leakage and water penetration in accordance with AAMA 502, Test Method A, by applying same test pressures required for performance.
2. Testing Extent: Three windows as selected by Architect and a qualified independent testing and inspecting agency. Test windows immediately after installation.
3. Window will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts as recommended in writing by manufacturer.

B. Clean factory-finished steel surfaces immediately after installing windows. Comply with manufacturer's written instructions for final cleaning and maintenance. Avoid damaging protective coatings and finishes.

C. Protect window surfaces from contact with contaminating substances resulting from construction operations. Remove contaminants immediately in accordance with manufacturer's written instructions.

D. Refinish or replace windows with damaged finish.

END OF SECTION 085123.23

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 085200 - WOOD WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes Clad Traditional Cottage Style Single Hung wood windows complete with hardware, glazing, weatherstripping, screens, jamb extensions, performance divided lites, and standard or specified anchorages, trim, attachments, and accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for wood windows.

B. Shop Drawings: For wood windows.

1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples for Initial Selection: For units with factory-applied finishes.

1. Include Samples of hardware and accessories involving color selection.

D. Samples for Verification: For wood windows and components required, prepared on Samples of size indicated below:

1. Exposed Finishes: 2 by 4 inches.
2. Exposed Hardware: Full-size units.

E. Product Schedule: For wood windows. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each type of wood window, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For manufacturer's warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to wood window manufacturer for installation of units required for this Project.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, and air infiltration.
c. Faulty operation of movable sash and hardware.
d. Deterioration of materials and finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: 10 years from date of Substantial Completion.
b. Glazing Units: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wood windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: WDMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: R.
2. Minimum Performance Grade: 15.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F.

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.

E. Sound Transmission Class (STC): Rated for not less than 26 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.

F. Outside-Inside Transmission Class (OITC): Rated for not less than 22 OITC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E1332.

G. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 1 for basic protection.

2.3 WOOD WINDOWS

1.

B. Wood Windows:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Marvin Windows, Ultimate Insert Single Hung Insert G2, or comparable products by one of the following:
   a. Kolbe & Kolbe Millwork Co., Inc.
   b. Pella Windows.
   c. Winco Windows.
   d. Or Approved Equal.

C. Operating Types: Provide the following operating types in locations indicated on Drawings:
1. Single hung.
2. Fixed.

D. Frame: Constructed of kiln-dried pine, with pine interior stops and mull casings on mulled units, water repellent, preservative treated in accordance with WDMA I.S. 4-07'A. Ultra assembled frames have factory installed heavy vinyl nailing fins at head, side jambs, and sill. Nailing fin at head has integral drip cap. Transom head drip cap to be field applied to frame. Units with brickmould or casing do not have a vinyl nailing fin factory applied as standard.
1. Jamb: 3/4 inch at the side jambs and head.

2. Standard overall jamb with extensions applied: 4-9/16 inch.
3. Sill thickness: 1-3/16 inch with 14° slope.
4. Exterior: All frame parts are .050 inch thick 6063 extruded aluminum alloy with accessory grooves, press fit onto the wood frame.
5. Corner Construction: Head and side jambs have mitered corners and use internal corner keys with sealer. Sill end has a profile cut and utilizes an end key with sealer.

E. Sashes: Fine- Constructed of kiln dried pine, water repellent, preservative treated in accordance with WDMA I.S. 4-07'A.

1. Thickness: 1-3/8 inch.

2. Exterior: Sash parts are completely covered by a .019 inch thick 5052 roll formed aluminum alloy with all corners lap jointed and sealed.
3. Corner Construction: Mortise-and-tenon.
4. Other wood species available:
5. Interior glazed.
6. Sash Lift Handles: Manufacturer's "Curved Sash Lift Handles"; two (2) per sash. Color shall be as selected by Architect from full range of colors.

F. Surface Finish:
1. Exterior Finish: Aluminum.
2. Standard Paint Colors: Exterior aluminum frame and sash components, and PDL bars are to have a 70% fluoropolymer based coating in compliance with AAMA 2605-13 specifications. Color is to be as selected by Architect from full range of colors available.
3. Interior Finish: Wood.
   a. Interior wood is to have a water based stain with a clear water based top coat. Stain color is to be as selected by Architect from full range of of colors available.

G. Performance Divided Lites (PDL): PDL system utilizes a permanently adhered wood grille bar to the interior and a permanently adhered aluminum grille bar to the exterior glass.
1. Material: Muntin is constructed of .050 inch (1mm) thick 6063 extruded aluminum alloy on exterior, pine on interior 5/8 inch (16mm) wide, beveled profile.
2. Spacer bar between the glass. Finish as selected by Architect from full range of options.
3. Exterior surface finish: To match frame and sash exterior.

H. Accessories & Trim
1. Casings:
   a. 3-1/2 inch profiled brickmould.
2. Nosings:
   a. 2-1/8 inch projected sill nosing with end caps.
3. Frame Expanders
   a. To suit conditions.

I. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

J. Hung Window Hardware:

1. Counterbalancing Mechanism: Spring loaded block and tackle mechanical balancing system with polyester cord. Balance case is painted to match liner. Zinc diecast pins engage and release balance clutches allowing the sash to be tilted in and removed for cleaning.
2. Locks and Keeper: Pick resistant cam locks with concealed locking mechanism including alignment legs. Sash lock and keeper constructed of high-pressure die-cast zinc with aluminum back plate.
3. Finishes: As selected by Architect from full range of options and colors available.

K. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
1. Frame Head Parting Stop: Rigid weatherable PVC parting stop with flexible fins.
   a. Color: Beige.
2. Top Rail, Check Rail, and Bottom Rail: Black TPE compression bulb.
3. Sill: Rigid weatherable, UV resistant PVC water seal/weatherstrip. Passes drop dart test.
   a. Color: As selected by Architect from manufacturers full range of color.
4. Head Pad: Polyurethane and polyethylene foam pad.
5. Jambliners: Made of weatherable, UV resistant PVC. Passes drop dart test.
   a. Color: As selected by Architect from manufacturers full range of color.
6. Transom Frame Nosing: Full perimeter 7/8 inch closed cell foam backer rod.

L. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 GLAZING

A. Type 1: Double Pane. Basis of Design manufacturer's LoE insulating glass, with a stainless steel spacer bar, 20-year warranty; 9/16 inch thick with LoE2-270, argon filled.

B. Type 2: Double Pane. Manufacturer's LoE insulating Safety glass; 9/16 inch thick with a stainless steel spacer bar, option on surface 2 and a hard coat on surface 4 plus permanent coating (interior pane).
1. Glazing shall comply with the test criteria for Category Classification II per CPSC 16 CFR Part 1201.
2. Provide etched labels.
3. Patterned, bronze, or gray-lite.
4. Protective film.

C. Glazing Methods:
1. High Performance option operating units and fixed units have silicone-glazed structural silicone bedding sealant on #1 surface with a 0.5 inch bite, and supplemental siliconized latex sealant on #4 surface at bottom wood glazing bead.

D. Glass Options:

1. Manufacturer's LoE glass with LoE²-270 option on surface 2 and a LoE hard coat on surface 4 plus permanent coating (interior pane)].
2. Patterned, bronze, or gray-lite.
3. Safety glass available for Type 2 glazing.
4. Protective film.

E. Glazing Bead Options:
1. Beveled profile.

2.5 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Surrounds: Full

2. Screen cloth: Basis of Design Manufacturer's BetterVue® Black fiberglass; color as selected by Architect.
3. Screen Channels: .024 inch (0.6mm) thick roll formed aluminum.
4. Attachment: Spring loaded plungers.
5. Corner Construction and Finish Color: Screen channel colors to match exterior colors. Channels are joined and reinforced with a corner key. Screens are available for segment head and 1/2 circle top units.

2.6 FABRICATION

A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.

B. Glaze wood windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.

E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.

B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Windows will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085200

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.

C. Related Sections:

1. Division 06 Section “Rough Carpentry”.
2. Division 08 Section “Hollow Metal Doors and Frames”.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section “Aluminum-Framed Entrances”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.

3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: Experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

a. Hager Companies (HA) - AB Series, 3 knuckle.
b. Ives (IV) - 3CB Series, 3 knuckle.
c. McKinney (MK) - TA Series, 3 knuckle.\
d. Or Approved Equal.

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:

a. Bommer Industries (BO).
b. Hager Companies (HA).
c. Pemko (PE).
d. Or Approved Equal.

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets with a 1-year warranty. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Hager Companies (HA) - ETW-QC (# wires) Option.
b. Ives (IV) - Connect.
c. McKinney (MK) - QC (# wires) Option.
d. Or Approved Equal.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. Hager Companies (HA) - Quick Connect.
b. Falcon (FA) - Connect.
c. McKinney (MK) - QC-C Series.
d. Or Approved Equal.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

a. Door Controls International (DC).
b. Rockwood (RO).
c. Trimco (TC).
d. Or Approved Equal.

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:

a. Hiawatha, Inc. (HI).
b. Rockwood (RO).
c. Trimco (TC).
d. Or Approved Equal.

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer’s Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Three (3).
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).

b. MMF Industries (MM).
c. Telkee (TK).
d. Or Approved Equal.

2.7 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Heavy duty mortise locks shall have a ten-year warranty.

2. Where specified, provide status indicators with highly reflective color and wording for “locked/unlocked” or “vacant/occupied” with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1” x 0.6” with a curved design allowing a 180-degree viewing angle with protective covering to prevent tampering.

3. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.
c. Schlage (SC) - L9000 Series.
d. Or Approved Equal.

2.8 AUXILIARY LOCKS

A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - DL4000 Series.
b. Sargent Manufacturing (SA) - 4870 Series.
c. Schlage (SC) - L460 Series.
d. Or Approved Equal.

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

a. HES (HS) - 1500/1600 Series.
b. Rutherford Controls (RCI).
c. Adams Rite.
d. Or Approved Equal.

B. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes conforming to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.

1. Manufacturers:

a. HES (HS) - 9400/9500/9600/9700/9800 Series.
b. Rutherford Controls (RCI).
c. Adams Rite.
d. Or Approved Equal.

C. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.

2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

10. Rail Sizing: Provide exit device rails factory sized for proper door width application.

11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
b. Sargent Manufacturing (SA) - 80 Series.
c. Von Duprin (VD) - 35A/98 XP Series.
d. Or Approved Equal.

2.12 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.

1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.

3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.

4. Manufacturers:

a. Corbin Russwin Hardware (RU) - ED5000 Series.
b. Sargent Manufacturing (SA) - 80 Series.
c. Von Duprin (VD) - 35A/98 XP Series.
d. Or Approved Equal.

2.13 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 25-year warranty.

2. Manufacturers:

a. LCN Closers (LC) - 4040XP Series.
b. Norton Rixson (NO) - 9500 Series.
c. Sargent Manufacturing (SA) - 281 Series.
d. Or Approved Equal.

2.14 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Hiawatha, Inc. (HI).
b. Rockwood (RO).
c. Trimco (TC).
d. Or Approved Equal.

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Norton Rixson (RF).
b. Rockwood (RO).
c. Sargent Manufacturing (SA).
d. Or Approved Equal.

2.15 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).
4. Or Approved Equal.

2.16 ELECTRONIC ACCESSORIES

A. Request-to-Exit Motion Sensor: Request-to-Exit Sensors motion detectors specifically designed for detecting exiting through a door from the secure area to a non-secure area. Include built-in timers (up to 60 second adjustable timing), door monitor with sounder alert, internal vertical pointability coverage, 12VDC or 24VDC power and selectable relay trigger with fail safe/fail secure modes.

1. Manufacturers:

a. Alarm Controls (AK) - SREX Series.
b. Securitron (SU) - XMS Series.
c. Bosch Security Systems.
d. Or Approved Equal.

B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 3280 Series.
b. Securitron (SU) - DPS Series.
c. Schlage
d. Or Approved Equal.

C. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

2. Manufacturers:

a. Securitron (SU) - AQL Series.
b. Uticor
c. Allen-Bradley by Rockwell Automation.
d. Or Approved Equal.

2.17 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.18 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.5 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.6 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.7 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. SA - SARGENT
5. HS - HES
6. RF - Rixson
7. NO - Norton
8. OT - Other
9. SU - Securitron

Hardware Sets

Set: 1.0

Doors: P01

1 Continuous Hinge	FM__HD1	BSP	PE

1	Dormitory/Exit Lock	8225 LNMP	BSP	SA
1	Conc Overhead Stop	1-X36	BSP	RF
1	Surface Closer	9500 / P9500	BSP	NO
1	Threshold	to architect detail		PE
1	Gasketing	290BSPPK x 2891BSPPK		PE
1	Sweep	18061BSPNB		PE

Set: 2.0

Doors: 005A

3	Hinge, Full Mortise	TA714	BSP	MK
1	Rim Exit Device, Storeroom	12 8804 ETMP	BSP	SA
1	Electric Strike	9600	BSP	HS
1	Surface Closer	9500 / P9500	BSP	NO
1	Door Stop	RM850 / RM860	BSP	RO
1	Gasketing	S773BL		PE
1	Wiring Diagram	WD-SYSPK		
1	Position Switch	DPS-M/W-BK		SU
1	Motion Sensor	XMS		SU
1	Card Reader	by Security System Supplier		OT
1	Power Supply	AQL Series (Amps & Relays as Required)		SU

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Inside activating request to exit switch shunts door contact from reporting an alarm and allowing authorized egress at all times. With loss of power door remains locked.

Set: 3.0

Doors: 115

4	Hinge, Full Mortise	TA714	BSP	MK
2	Hinge, Full Mortise	TA714 QC	BSP	MK
2	Surface Vert Rod Exit	16 55 56 NB8706 ETMP	BSP	SA
2	Surface Closer	9500 / P9500	BSP	NO
2	Door Stop	RM850 / RM860	BSP	RO
2	ElectroLynx Harness - Frame	QC-C1500P		MK
2	ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK
1	Wiring Diagram	WD-SYSPK		

2 Position Switch	DPS-M/W-BK		SU
1 Card Reader	by Security System Supplier		OT
1 Power Supply	AQL Series (Amps & Relays as Required)		SU

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch shunting door contact from reporting an alarm and allowing authorized egress at all times. With loss of power door remains locked.

Set: 3.1

Doors: 114

6 Hinge, Full Mortise	TA714	BSP	MK
2 Push Plate	70C-RKW	BSP	RO
2 Door Pull	RM7907-12	BSP	RO
2 Auto Operator	by Section 087113		OT
2 Door Stop	RM850 / RM860	BSP	RO
2 Operator Paddle	by Section 087113		OT

Set: 4.0

Doors: 005B

4 Hinge, Full Mortise	TA714	BSP	MK
2 Hinge, Full Mortise	TA714 QC	BSP	MK
1 Surface Vert Rod Exit, Exit Only	12 55 NB8710 EO	BSP	SA
1 Surface Vert Rod Exit	12 55 56 NB8706 ETMP	BSP	SA
2 Surface Closer	9500 / P9500	BSP	NO
2 Door Stop	RM850 / RM860	BSP	RO
1 Gasketing	S773BL		PE
1 Astragal	S771x6BL		PE
2 ElectroLynx Harness - Frame	QC-C1500P		MK
2 ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK
1 Wiring Diagram	WD-SYSPK		
2 Position Switch	DPS-M/W-BK		SU
1 Card Reader	by Security System Supplier		OT
1 Power Supply	AQL Series (Amps & Relays as Required)		SU

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch shunting door contact from reporting an alarm and allowing authorized egress at all times. With loss of power door remains locked.

Set: 6.0

Doors: 002, 002D

3	Hinge, Full Mortise	TA714	BSP	MK
1	Rim Exit Device, Classroom	12 8813 ETMP	BSP	SA
1	Surface Closer	9500 / P9500	BSP	NO
1	Door Stop	RM850 / RM860	BSP	RO
3	Silencer	608		RO

Set: 7.0

Doors: 105

6	Hinge, Full Mortise	TA714	BSP	MK
2	Surface Vert Rod Exit, Passage	12 NB8715 ETMP	BSP	SA
2	Surface Closer	9500 / P9500	BSP	NO
2	Electromagnetic Holder	998M	693	RF
1	Gasketing	S773BL		PE
1	Astragal	S771x6BL		PE

Set: 8.0

Doors: 008, 016, 104, 210, 216, 310, 316, 412, 424

3	Hinge, Full Mortise	TA714	BSP	MK
1	Rim Exit Device, Passage	8815 ETMP	BSP	SA
1	Surface Closer	9500 / P9500	BSP	NO
1	Door Stop	RM850 / RM860	BSP	RO
1	Gasketing	S773BL		PE

Set: 12.0

Doors: 001, 004, 009, 010, 112, 113, 205, 305, 405

6	Hinge, Full Mortise	TA714	BSP	MK
1	Storeroom/Closet Lock	8204 LNMP	BSP	SA
1	Electric Strike	1600-CLB	BSP	HS

2	Surface Closer	9500 / P9500	BSP	NO
2	Door Stop	RM850 / RM860	BSP	RO
2	Silencer	608		RO
1	Position Switch	DPS-M/W-BK		SU
1	Motion Sensor	XMS		SU
1	Card Reader	by Security System Supplier		OT
1	Power Supply	AQL Series (Amps & Relays as Required)		SU

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Inside activating request to exit switch shunts door contact from reporting an alarm and allowing authorized egress at all times. With loss of power door remains locked.

Set: 13.0

Doors: 204, 304, 404

3	Hinge, Full Mortise	TA714	BSP	MK
1	Storeroom/Closet Lock	8204 LNMP	BSP	SA
1	Electric Strike	1600-CLB	BSP	HS
1	Surface Closer	9500 / P9500	BSP	NO
1	Door Stop	RM850 / RM860	BSP	RO
3	Silencer	608		RO
1	Position Switch	DPS-M/W-BK		SU
1	Motion Sensor	XMS		SU
1	Card Reader	by Security System Supplier		OT
1	Power Supply	AQL Series (Amps & Relays as Required)		SU

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Inside activating request to exit switch shunts door contact from reporting an alarm and allowing authorized egress at all times. With loss of power or activation of building fire system door remains unlocked.

Set: 13.1

Doors: 217, 317, 422

3	Hinge, Full Mortise	TA714	BSP	MK
1	Storeroom/Closet Lock	8204 LNMP	BSP	SA

1	Electric Strike	1600-CLB	BSP	HS
1	Surface Closer	9500 / P9500	BSP	NO
1	Door Stop	RM850 / RM860	BSP	RO
3	Silencer	608		RO
1	Position Switch	DPS-M/W-BK		SU
1	Motion Sensor	XMS		SU
1	Card Reader	by Security System Supplier		OT
1	Power Supply	AQL Series (Amps & Relays as Required)		SU

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Inside activating request to exit switch shunts door contact from reporting an alarm and allowing authorized egress at all times. With loss of power or activation of building fire system door remains locked.

Set: 14.0

Doors: 012, 102A, 103

3	Hinge, Full Mortise	TA714	BSP	MK
1	Storeroom/Closet Lock	8204 LNMP	BSP	SA
1	Electric Strike	1600-CLB	BSP	HS
1	Surface Closer	9500 / P9500	BSP	NO
1	Door Stop	RM850 / RM860	BSP	RO
1	Gasketing	S773BL		PE
1	Position Switch	DPS-M/W-BK		SU
1	Motion Sensor	XMS		SU
1	Card Reader	by Security System Supplier		OT
1	Power Supply	AQL Series (Amps & Relays as Required)		SU

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Inside activating request to exit switch shunts door contact from reporting an alarm and allowing authorized egress at all times. With loss of power door remains locked.

Set: 15.0

Doors: 101, 102B

3	Hinge, Full Mortise	TA714	BSP	MK

1	Storeroom/Closet Lock	8204 LNMP	BSP	SA
1	Electric Strike	1600-CLB	BSP	HS
1	Surf Overhead Stop	9-X36	BSP	RF
1	Surface Closer	9500 / P9500	BSP	NO
1	Gasketing	S773BL		PE
1	Position Switch	DPS-M/W-BK		SU
1	Motion Sensor	XMS		SU
1	Card Reader	by Security System Supplier		OT
1	Power Supply	AQL Series (Amps & Relays as Required)		SU

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Inside activating request to exit switch shunts door contact from reporting an alarm and allowing authorized egress at all times. With loss of power door remains locked.

Set: 16.0

Doors: 006, 108, 201, 301, 401

3	Hinge, Full Mortise	TA714	BSP	MK
1	Classroom Deadlock	4877	BSP	SA
1	Push Plate	70C-RKW	BSP	RO
1	Door Pull	RM7907-12	BSP	RO
1	Surface Closer	9500 / P9500	BSP	NO
1	Door Stop	RM850 / RM860	BSP	RO
3	Silencer	608		RO

Set: 19.0

Doors: 007, 013, 102C, 107, 202, 302, 402

3	Hinge, Full Mortise	TA714	BSP	MK
1	Storeroom/Closet Lock	8204 LNMP	BSP	SA
1	Door Stop	RM850 / RM860	BSP	RO
3	Silencer	608		RO

Set: 20.0

Doors: 011, 109

3	Hinge, Full Mortise	TA714	BSP	MK

1	Storeroom/Closet Lock	8204 LNMP	BSP	SA
1	Surface Closer	9500 / P9500	BSP	NO
1	Door Stop	RM850 / RM860	BSP	RO
3	Silencer	608		RO

Set: 21.0

Doors: 001A, 001B, 001C, 101A, 101B, 112A, 112B, 113A, 113B, 113C, 207, 208, 209, 213, 214, 215, 307, 308, 309, 313, 314, 315, 406, 407, 408, 409, 410, 411, 414, 415, 416, 417, 418A, 420, 421

3	Hinge, Full Mortise	TA714	BSP	MK
1	Office/Entry Lock	8205 LNMP	BSP	SA
1	Door Stop	RM850 / RM860	BSP	RO
3	Silencer	608		RO

Set: 21.2

Doors: 418

3	Hinge, Full Mortise	TA714	BSP	MK
1	Office/Entry Lock	8205 LNMP	BSP	SA
1	Conc Overhead Stop	1-X36	BSP	RF
3	Silencer	608		RO

Set: 22.0

Doors: 418B

3	Hinge, Full Mortise	TA714	BSP	MK
1	Privacy Lock	V21 8265 LNMP	BSP	SA
1	Door Stop	RM850 / RM860	BSP	RO
3	Silencer	608		RO

Set: 23.0

Doors: 002B, 002C, 003, 110

3	Hinge, Full Mortise	TA714	BSP	MK
1	Privacy Lock	V21 8265 LNMP	BSP	SA
1	Surface Closer	9500 / P9500	BSP	NO
1	Door Stop	RM850 / RM860	BSP	RO
3	Silencer	608		RO

Set: 24.0

Doors: 111, 206, 212, 306, 312

3	Hinge, Full Mortise	TA714	BSP	MK
1	Passage Latch	8215 LNMP	BSP	SA
1	Door Stop	RM850 / RM860	BSP	RO
3	Silencer	608		RO

Set: 24.1

Doors: 211, 311, 413

3	Hinge, Full Mortise	TA714	BSP	MK
1	Passage Latch	8215 LNMP	BSP	SA
1	Conc Overhead Stop	1-X36	BSP	RF
3	Silencer	608		RO

Set: 25.0

Doors: 203, 303, 403A, 403B

3	Hinge, Full Mortise	TA714	BSP	MK
1	Passage Latch	8215 LNMP	BSP	SA
1	Surface Closer	9500 / P9500	BSP	NO
1	Door Stop	RM850 / RM860	BSP	RO
1	Gasketing	S773BL		PE

Set: 26.0

Doors: 017

2	Continuous Hinge	FM__SLF-HD1 x PT	BSP	PE
1	Exit Device (storeroom)	16 55 56 AD8504 863	BSP	SA
1	Rim Exit Device, Dummy	16 55 56 AD8510 863	BSP	SA
2	Conc Overhead Stop	1-X36	BSP	RF
2	Surface Closer	9500 / P9500	BSP	NO
1	Threshold	to architect detail		PE
2	ElectroLynx Harness - Frame	QC-C1500P		MK
2	ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK
1	Wiring Diagram	WD-SYSPK		
2	Position Switch	DPS-M/W-BK		SU
1	Card Reader	by Security System Supplier		OT
1	Power Supply	AQL Series (Amps & Relays as		SU

Required)

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch shunting door contact from reporting an alarm and allowing authorized egress at all times. With loss of power door remains locked.

Set: 27.0

Doors: E4

2 Auto Operator	by Section 087113		OT
2 Operator Paddle	by Section 087113		OT

Notes: Balance of existing hardware to remain

Set: 28.0

Doors: GATE

3 Hinge, Spring	1502		BSP	MK
1 Electromagnetic Holder	998M		693	RF

Notes: Balance of hardware by Gate Supplier.

END OF SECTION 087100

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 087113 – AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the following types of automatic door operators:
   1. Low energy and power assist door operators for swinging doors.

B. Related Sections:
   1. Division 7 Sections for caulking to the extent not specified in this section.
   2. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for entrances furnished separately in Division 8 Section.
   3. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
   4. Division 26 and 28 Sections for electrical connections including conduit and wiring for automatic entrance door operators and access control devices.

1.3 REFERENCES

A. References: Refer to the version year adopted by the Authority Having Jurisdiction.
   1. A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.

B. American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA).
   1. ANSI/BHMA A156.10 American National Standard for Power Operated Pedestrian Doors.
   2. ANSI/BHMA A156.19 Standards for Power Assist and Low Energy Power Operated Doors.

C. Underwriters Laboratories (UL).
   1. UL Listed R-9469 Fire Door Operator with Automatic Closer.
   2. UL10C – Positive Pressure Fire Tests of Door Assemblies.
   3. UL 325 Standard for Safety for Door, Drapery, Gate, Louver and Window Operators and Systems.
   4. UL991 Listed - Tests for Safety-Related Controls Employing Solid-State Device.
   5. UL244A – Solid – State Controls for Appliances.
   6. UL1998 – Software in Programmable Components.
   7. UL1310 – Class 2 Power Units.

D. American Association of Automatic Door Manufacturers (AAADM).

E. American Society for Testing and Materials (ASTM).
   1. ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
   2. ASTM B209 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

F. American Architectural Manufacturers Association (AAMA).
   1. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.

G. National Association of Architectural Metal Manufacturers (NAAMM).
   1. Metal Finishes Manual for Architectural Metal Products.

H. International Code Council (ICC).
   1. IBC: International Building Code.

1.4 DEFINITIONS

A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to activate the operation of the door.
   1. Knowing act: Consciously initiating the opening of a power operated door using acceptable methods including wall mounted switches such as push plates and controlled access devices such as keypads, card readers and key switches.

B. Safety Device: A device that detects the presence of an object or person within a zone where contact could occur and provides a signal to stop the movement of the door.

1.5 PERFORMANCE REQUIREMENTS

A. Automatic door equipment accommodates medium to heavy pedestrian traffic.

B. Opening Force Requirements: Doors shall open with a manual force, not to exceed 30lbf (133N) to set the door in motion and 15 lbf to fully open the door applied at 1” (25 mm) from the latch edge of the door. The force required to prevent a stopped door from opening or closing shall not exceed 15 lbf (67 N) measured 1” (25 mm) from the latch edge of the door at any point during opening or closing.

C. Break Away Device: Swinging automatic entrances shall require no more than 50 lbf (222 N) applied 1” (25 mm) from the latch edge of the door. When the door(s) is opened in the breakout mode, powered operated components excluding spring power shall not operate the doors.

D. Closing Time:
   1. Doors shall be field adjustable to close from 90 degrees to 10 degrees in 3 seconds or longer as applicable per ANSI/BHMA A156.19 standards.
   2. Doors shall be field adjusted to close from 10 degrees to fully closed in not less than 1.5 seconds.

1.6 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, fabrication, operational descriptions and finishes.

B. Shop Drawings: Submit manufacturer’s shop drawings, including elevations, sections and details, indicating dimensions, materials, operator, motion /presence sensor control device, anchors, hardware, finish, options and accessories.
   1. Indicate required clearances, and location and size of each field connection.
   2. Indicate locations and elevations of entrances showing activation and safety devices.
   3. Wiring Diagrams: For power, signal, and activation / safety device wiring.

C. Samples: Submit manufacturer’s samples of aluminum finish.

D. Manufacturers Field Reports: Submit manufacturer’s field reports from AAADM certified technician of inspection and approval of doors for compliance with ANSI/BHMA after completion of installation.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the work of this section in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the operators and their nearest service representatives. The final copies delivered after completion of the installation test to include spare parts list.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.7 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with documented experience in manufacturing of doors and equipment of similar to that indicated for this Project and that have a proven record of successful in-service performance. Manufacturer to have a company certificate issued by AAADM.

B. Installer Qualifications: Installers, trained by the primary product manufacturers, with documented experience installing and maintenance of units similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Certified Inspector Qualifications: Certified by AAADM.

D. Source Limitations for Automatic Door Operators: Obtain each type of door, frame, operator and sensor components specified in this Section from a single source, same manufacturer unless otherwise indicated.

E. Certifications: Operators shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards.
   1. ANSI/BHMA A156.10 American National Standard for Power Operated Pedestrian Doors.

2. ANSI/BHMA A156.19 American National Standard for Power Assist and Low Energy Operated Doors.
3. NFPA 101 - Life Safety Code.

F. Emergency Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrance doors serving as a required means of egress.

1.8 COORDINATION

A. Coordinate door operators with doors, frames and related work to ensure proper size, thickness, hand, function and finish. Coordinate hardware for automatic entrances with hardware required for rest of the project.

B. Electrical System Roughing-in: Coordinate layout and installation of power door operators with connections to power supplies and access control system as applicable.

1.9 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Automatic Door Operators shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.

C. During the warranty period a factory-trained technician shall perform service and affect repairs. An inspection shall be performed after each adjustment or repair.

D. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal business hours.

E. Manufacturer shall have in place a dispatch procedure that shall be available 24 hours a Day, 7 Days a week for emergency call back service.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, as indicated below:
1. Extruded Aluminum, Alloy 6063-T5.

2.2 SWING DOOR OPERATORS

A. Model: Basis-of-Design Product: Subject to compliance with requirements, provide Besam ASSA ABLOY SW200i low energy automatic door operator or comparable product by one of the following: Stanley Access Technologies, Dormakaba, Or Approved Equal.
1. Reference Standard: ANSI/BHMA A156.19.
2. Configuration: Operator to control single pairs of swinging doors as indicated on the drawings and specified below:

a. Traffic Pattern: Two way.
b. Pairs of Doors: Simultaneous swing.

3. Automatic Door Operator: Electro-mechanical, non-handed operator, powered by 24 volt, 1/4 hp motor. Operator shall be adjustable to compensate for different manual push forces as required.
   a. Automatic operator shall be capable of operating and controlling up to a 350 pound (317.5 kg) door, 48 inches (1219 mm) in width.
   b. Surface Mounted:
      1) Access Operator Housing: Operator is contained in a 6 inch (152.4 mm) x 6 inch (152.4 mm) high side access, extruded aluminum housing with a hinged cover.
      2) Surface Mounted Housing: Mounted above door header, continuous for full width of door.
      3) Center Pivoted Door Connecting Hardware: Surface mounted operators to have a cast steel arm from the operator, surface mounted to the top edge of the swing door.
   c. Operator shall be field switchable between an ANSI/BHMA A156.19 and an ANSI/BHMA A156.10 compliant operator and vice versa. Addition of the required safety sensors, activation devices and guard rails may be required to comply with the applicable standard.
   d. Operator Temperature Range: Capable of operating within temperature ranges of -31° F to 160° F (-35° C to 71° C).
   e. Electrical Characteristics: Maximum power consumption is 300 watts (2.5 amps at 120 VAC), 50/60hz, built-in thermal overload protection.
   f. Battery Convenience Mode: Operator to maintain continuous operation by battery power during power failure. Battery is continuously monitored and provides a warning signal if the battery is not working properly.
4. Door Operation:
   a. Opening Cycle The adjustable speed operator mechanically powers the drive shaft and the torque control maintains constant speed throughout the opening cycle regardless of stack pressures or wind speed. Operator shall allow manual door operation with operational forces as indicated to fully open the door applied at 1” (25 mm) from the latch edge of the door.
      1) Manual push force shall be adjustable from 5 lbf to 15 lbf maximum.
   b. Hold Open: The operator shall stop and hold the door open at the selected door opening angle for an adjustable period of time (1.5 seconds to 30 seconds).
   c. Closing Cycle: Spring close with speed controlled power assist.
      1) Upon loss of power, dynamic braking will control the door insuring controlled closing.
      2) Selectable Torque Control: Automatically adjusts torque without changing the closing speed of the operator.
         a) When the torque control is activated, the closing speed shall remain constant regardless of stack pressures or wind speed.
         b) Torque Cancellation: The torque control is deactivated whenever there is a signal received from door mounted sensors.
         c) The torque control is disabled during manual use of the door.
   d. Wind Force Dampening: The operator electromechanically counteracts wind forces, slowing down the door movement to safely open or close the door.
   e. Stack Pressure Compensation: Operator shall counteract positive stack pressures, negative stack pressures, and sudden changes of stack pressures. The operator

never allows the door to open or close faster than the speed control settings, regardless of pressures.

f. Obstruction Control: The operator will stop and reverse the door movement.

g. Electric Lock Management:

1) Internal module for electrified locking integration.

2) Electric Lock Output: Selectable 12 VDC, maximum 1200 mA / 24 VDC, maximum 600 mA.

3) Lock monitoring prevents operator(s) from opening door(s) until release of electrified lock.

4) Operator pulls door closed before opening, automatically unjamming electric latch hardware.

5) Sequenced operation between operators for pairs of doors allowing lock release and astragal coordination.

h. Lock Retry Circuit: If attempt to fully close the door is unsuccessful, the operator will automatically reverse open 10 degrees and reclose in an attempt to successfully close the door.

i. Selectable Alarm Reset: The operator can be field set so that after receiving an alarm signal, the operator will not accept any activation impulses and will operate only as a manual door closer until manually reset.

j. Electronic Controls: Solid state integrated circuit controls the operation and switching of the swing power operator. The electronic control provides low voltage power supply for all means of actuation. The controls include time delay (1 to 30 seconds) for normal cycle.

k. Control Switch: Automatic door operators shall be equipped with the following type of multi-position function switch:

1) Three position toggle switch remotely mounted (On-Off-Hold).

5. Operator Interface:

a. Safety Sensor Integration for overhead presence safety device and door mounted reactivation safety sensors.

2.3 ACTIVATION BY SMOKE EVACUATION SYSTEM

A. General: Provide activation by the smoke evacuation system and/or fire detection system. Coordinate other required activation devices and safety devices with door operation and door operator mechanisms.

B. Activation: Smoke evacuation system and/or fire detection system shall provide activation of the operator by means of a normally open maintained contact to control the opening and closing of the door systems in the event of an alarm condition. Doors are to be held open until the smoke evacuation/fire detection system is reset.

2.4 ACTIVATION DEVICES

A. General: Provide activation devices in accordance with ANSI/BHMA standards, for condition of exposure and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.

B. Knowing Act Activation Device:

1. Push Plate: Hard wired, 4-1/2 inch square stainless steel push plate switches engraved with "Push to Open" with a blue handicap logo.

C. Manual Operation:
   1. Operator shall allow manual door operation with operational forces adjustable from 5 lbf to 15 lbf maximum.

2.5 SAFETY DEVICES

A. General: Provide safety devices in accordance with ANSI/BHMA A156.10 standards, for condition of exposure and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated. Coordinate safety devices with door operation and door operator mechanisms.

B. Safety Devices:
   1. Door Mounted Safety Sensor Devices: Safety sensor devices shall be door mounted as specified.
      a. The door mounted safety sensor devices shall be mounted on both the swing (pull) side and the approach (push) side of the door (2 safety sensors per leaf), providing detection on sides of the door.

2.6 ALUMINUM FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Automatic Door Operator Enclosure:
   1. Anodized Finish:
      a. AAMA 611, Dark Bronze, AA-M12C22A44, Class I, 0.018 mm.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, wall and floor construction, and other conditions affecting performance of swinging power operated doors.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections.

C. Proceed only after such discrepancies or conflicts have been resolved.

3.2 INSTALLATION

A. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.

B. Operators: Install automatic door operators plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.

C. Door Operators: Connect door operators to electrical power distribution system including smoke evacuation system and/or fire detection system as specified in Division 26 Sections.

D. Sealants: Comply with requirements specified in division 7 Section “Joint Sealants” to seal between the operator housing and the adjacent surfaces.

E. Signage: Apply signage on both sides of each door and sidelite as required by ANSI/BHMA A156.19 and manufacturers installation instructions.

3.3 ADJUSTING

A. Adjust automatic door operators, controls and hardware for smooth and safe operation and for weather tight closure. Adjust doors in compliance with ANSI/BHMA standard.

3.4 FIELD QUALITY CONTROL

A. Before placing doors into operation, AAADM certified technician shall inspect and approve doors for compliance with ANSI/BHMA standard. Certified technician shall be approved by manufacturer.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by automatic door operator installation.

B. Clean metal surfaces promptly after installation. Remove excess sealants, compounds, dirt and other substances. Repair damages and finish to match original finish.

3.6 DEMONSTRATION

A. Engage a factory-authorized representative to train Owner's maintenance personnel to adjust, operate, and maintain safe operation of the door.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glass products.
2. Laminated glass.
3. Insulating glass.
4. Glazing sealants.
5. Glazing tapes.
6. Miscellaneous glazing materials.

B. Related Requirements:

1. Section 081416 “Flush Wood Doors.”
2. Section 084226 "All-Glass Entrances."
3. Section 085200 “Wood Windows.”
4. Section 088813 "Fire-Rated Glazing."

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

C. IBC: International Building Code.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type ofglass product other than clear monolithic vision glass the following products; 12 inches square.

C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For glass.

C. Product Test Reports: For fabricated glass and glazing sealants, for tests performed by a qualified testing agency.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Sample Warranties: For special warranties.

1.8 QUALITY ASSURANCE

A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved by primary glass manufacturer.

B. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal

(AG&M) contractors and who employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

E. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

   1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   2. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
   4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

   1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.12 WARRANTY

A. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat-soaked tempered glass units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent (3/1000) within specified warranty period. Coverage for any other cause is excluded.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain glass from single source from single manufacturer.

B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
1. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
2. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. Identification of Safety Glazing: Each pane of safety glazing installed in hazardous locations shall be identified by a manufacturer's designation specifying who applied the designation, the manufacturer or installer and the safety glazing standard with which it complies with. The designation shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that once applied, cannot be removed without being destroyed.

F. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F.
4. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
5. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

G. Acoustic Performance:
1. Interior Glazing: 41 STC.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.
1. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AGC Glass Company North America, Inc.
    b. Cardinal Glass Industries, Inc.
    c. Saint-Gobain Glass Group.
    d. Vitro Architectural Glass.
    e. Or Approved Equal.

B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Perimeter Spacer: Manufacturer's standard spacer material and construction

    a. Manufacturers: Subject to compliance with requirements provide products by one of the following:
        1) Viracon
        2) Saint-Gobain Glass Corp.
        3) Technoform Glass Insulation North America.
        4) Thermix; a brand of Ensinger USA.
        5) Or Approved Equal.

3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.

B. Neutral-Curing Silicone Glazing Sealant, Class 50: Complying with ASTM C920, Type S, Grade NS, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Pecora Corporation.
    b. The Dow Chemical Company.
    c. Tremco.
    d. Or Approved Equal.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

    a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch-minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 MONOLITHIC GLASS SCHEDULE

A. Clear Glass Type: Fully tempered float glass.

1. Minimum Thickness: 6 mm.
2. Safety glazing required.

3.9 INSULATING GLASS SCHEDULE

A. Clear Insulating Glass Type:

1. Basis-of-Design Product: Viracon
2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Fully tempered float glass.
5. Interspace Content: Argon.
6. Indoor Lite: Fully tempered float glass.
7. Winter Nighttime U-Factor: 0.47 maximum.
8. Summer Daytime U-Factor: 0.49 maximum.
9. Safety glazing required.

END OF SECTION 088000

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 088813 - FIRE-RATED GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-protection-rated glazing.
2. Fire-resistance-rated glazing.

1.3 DEFINITIONS

A. Fire-Protection-Rated Glazing: Glazing in rated doors and openings up to 45 minutes, limited in size, and not capable of blocking radiant heat.

B. Fire-Resistance-Rated Glazing: Glazing that prevents spread of fire and smoke and radiant heat; used in rated wall and door applications 60 minutes and above without size limitations.

C. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

D. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product; 12 inches square.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and glass testing agency.

B. Product Certificates: For each type of glass and glazing product.

C. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the NGA's Certified Glass Installer Program.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during remainder of construction period.

1.10 WARRANTY

A. Manufacturer's Special Warranty for Tempered Glazing Units with Clear Intumescent Interlayer: Manufacturer agrees to replace units that deteriorate within specified warranty period. Deterioration of tempered glazing units with clear intumenscent interlayer is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning glass contrary to manufacturer's written instructions. Evidence of failure is air bubbles within units, or obstruction of vision by contamination or deterioration of intumescent interlayer.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: For each glass type, obtain from single source from single manufacturer.

B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.4 GLASS PRODUCTS

A. Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) unless otherwise indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing in accordance with NFPA 257 or UL 9, including hose-stream test, and shall comply with NFPA 80.

1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from hose-stream test.

B. Fire-Protection-Rated Tempered Glass: 6-mm thickness; fire-protection-rated tempered glass; complying with 16 CFR 1201, Category II.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Technical Glass Products; an Allegion Brand.
b. SAFTI FIRST Fire Rated Glazing Solutions.
c. Vetrotech Saint-Gobain.
d. McGrory Glass, Inc.
e. Or Approved Equal.

2.6 FIRE-RESISTANCE-RATED GLAZING

A. Fire-Resistance-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing in accordance with ASTM E119 or UL 263.

B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that glazing is approved for use in walls, and fire-resistance rating in minutes.

C. Fire-Resistance-Rated Framing and Doors: Fire-resistance-rated glazing with 60-, 90-, and 120-minute ratings requires framing and doors from glass supplier, tested as an assembly complying with ASTM E119 or UL 263.

D. Fire-Resistance-Rated Tempered Glazing Units with Clear Intumescent Interlayer: Glazing units made from two or more lites of uncoated, fully tempered, clear float glass; with a perimeter edge seal enclosing a cavity filled with optically clear, intumescent polymer; complying with 16 CFR 1201, Category II.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Technical Glass Products; an Allegion Brand.
    b. SAFTI FIRST Fire Rated Glazing Solutions.
    c. Vetrotech Saint-Gobain.
    d. McGrory Glass, Inc.
    e. Or Approved Equal.

2.7 GLAZING ACCESSORIES

A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.

B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Tremco Incorporated.
    b. The Dow Chemical Company.
    c. GE Construction Sealants; Momentive Performance Materials Inc.
    d. Or Approved Equal.

2. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

C. Perimeter Insulation for Fire-Resistance-Rated Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.

B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch-minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

I. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 FIRE-PROTECTION-RATED GLAZING SCHEDULE

A. Glass Type FPGL-1: 20-minute fire-protection-rated glazing without hose-stream test; fire-protection-rated tempered glass.

B. Glass Type FPGL-2: 45-minute fire-protection-rated glazing; fire-protection-rated monolithic glass or fire-protection-rated tempered glazing units with clear intumescent interlayer.

3.9 FIRE-RESISTANCE-RATED GLAZING SCHEDULE

A. Glass Type FRGL-1: 60-minute fire-resistance-rated glazing complying with ASTM E119 or UL 263 in a tested assembly of glass and framing with 450 deg F temperature-rise limitation; fire-resistance-rated tempered glazing units with clear intumescent interlayer.

B. Glass Type FRGL-2: 90-minute fire-resistance-rated glazing complying with ASTM E119 or UL 263 in a tested assembly of glass and framing with 450 deg F temperature-rise limitation; fire-resistance-rated tempered glazing units with clear intumescent interlayer.

END OF SECTION 088813

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidder and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed extruded-aluminum louvers.

B. Related Requirements:
1. Section 099123 "Interior Painting" for field painting interior louvers.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).

C. Vertical Louver: Louver with vertical blades (i.e., the axis of the blades are vertical).

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing according to AMCA 500-L.

F. Windborne-Debris-Impact-Resistant Louver: Louver that provides specified windborne-debris-impact resistance, as determined by testing according to AMCA 540.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural[**and seismic**] performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

B. Sample Warranties: For manufacturer's special warranties.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 WARRANTY

A. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fixed louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
   1. Wind Loads: Determine loads based on a uniform pressure of 30 lbf/sq. ft., acting inward or outward.

C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. Component Importance Factor: 1.0.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

F. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Sightproof, Drainable-Blade Louver:

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Greenheck Fan Corporation.
      b. Ruskin; Air Distribution Technologies, In. ;Johnson Controls, Inc.
      c. Airline Louvers, Mestek, Inc.
      d. Or Approved Equal.

2. Louver Depth: 5 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.080 inch for frames.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:

    a. Free Area: Not less than 8.3 sq. ft. for 48-inch-wide by 48-inch-high louver.
    b. Point of Beginning Water Penetration: Not less than 750 fpm.
    c. Air Performance: Not more than 0.10-inch wg static pressure drop at 550-fpm free-area intake velocity.

6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening, except where insect screening is indicated.

B. Secure screen frames to louver frames with machine screws with heads finished to match louver, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/2-inch-square mesh, 0.063-inch wire.
2. Bird Screening: Flattened, expanded aluminum, 3/4 by 0.050 inch thick.
3. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.

2.5 BLANK-OFF PANELS

A. Uninsulated Blank-Off Panels: Metal sheet attached to back of louver.

1. Aluminum sheet for aluminum louvers, not less than 0.050-inch nominal thickness.

2.6 MATERIALS

A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For fastening galvanized steel, use hot-dip-galvanized-steel or 300 series stainless-steel fasteners.
4. For fastening stainless steel, use 300 series stainless-steel fasteners.
5. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless-steel components, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing according to ASTM E488/E488M conducted by a qualified testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.7 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
2. Horizontal Mullions: Provide horizontal mullions at joints unless continuous vertical assemblies are indicated.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Interior flange unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

G. Provide subsills made of same material as louvers or extended sills for recessed louvers.

H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.8 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 092116.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidder and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assembly.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and support them on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.

B. Do not install finish panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: As indicated on Drawings.

B. Gypsum Shaftliner Board:

1. Type X: ASTM C1396/C1396M; manufacturer's proprietary fire-resistive liner panels with paper faces, 1 inch thick, with double beveled long edges.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) American Gypsum.
2) Georgia-Pacific Gypsum LLC.
3) USG Corporation.
4) Or Approved Equal.

C. Non-Load-Bearing Steel Framing, General: Complying with ASTM C645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated.

1. Protective Coating: ASTM A653/A653M, G60, hot-dip galvanized unless otherwise indicated.

D. Studs: Manufacturer's standard profile for repetitive, corner, and end members as follows:

1. Depth: As indicated.
2. Minimum Base-Metal Thickness: 0.030 inch.

E. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.

1. Minimum Base-Metal Thickness: Matching steel studs.

F. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ClarkDietrich.
b. Fire Trak Corp.
c. SCAFCO Steel Stud Company.
d. Or Approved Equal.

G. Finish Panels: Gypsum board as specified in Section 092900 "Gypsum Board.".

H. Sound Attenuation Blankets: As specified in Section 092900 "Gypsum Board."

2.3 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with shaft wall manufacturer's written instructions.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written instructions for application indicated.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.

E. Reinforcing: Galvanized-steel reinforcing strips with 0.033-inch minimum thickness of base metal (uncoated).

F. Acoustical Sealant: Section 079219 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 078100 "Applied Fire Protection."

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
   1. Reinforcing: Provide where items attach directly to shaft wall assembly as indicated on Drawings; accurately position and secure behind at least one layer of face panel.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092116.23

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidder and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For embossed, high-strength steel studs and tracks, firestop tracks, post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

C. Horizontal Deflection: For composite wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft..

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
2. Protective Coating: ASTM A653/A653M, G60, hot-dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.

1. Steel Studs and Tracks:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) ClarkDietrich.
2) Marino\WARE.
3) SCAFCO Steel Stud Company.
4) Or Approved Equal.

b. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
c. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Single Long-Leg Track System: ASTM C645 top track with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
a. Bridging Type: 1-1/2” cold-rolled channel and 1-1/2”x1-1/2” 16-gauge clip angles.

D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ClarkDietrich.
b. Marino\WARE.

c. SCAFCO Steel Stud Company.
d. Or Approved Equal.

E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch-wide flanges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ClarkDietrich.
b. Marino\WARE.
c. SCAFCO Steel Stud Company.
d. Or Approved Equal.

2. Depth: 1-1/2 inches.
3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C645.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. ClarkDietrich.
b. Marino/WARE.
c. SCAFCO Steel Stud Company.
d. Or Approved Equal.

2. Minimum Base-Steel Thickness: 0.0296 inch.
3. Depth: As indicated on Drawings.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.
1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidder and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.

B. Related Requirements:
1. Section 079219 "Acoustical Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
3. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum wallboard.
2. Gypsum board, Type X.
3. Gypsum ceiling board.
4. Gypsum board, Type C.
5. Interior trim.
6. Exterior trim.
7. Joint treatment materials.
8. Sound-attenuation blankets.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.
b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Gypsum.
    b. Georgia-Pacific Gypsum LLC.
    c. USG Corporation.
    d. Or Approved Equal.
2. Thickness: 1/2 inch.
3. Long Edges: Tapered.

B. Gypsum Board, Type X: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Gypsum.
    b. Georgia-Pacific Gypsum LLC.
    c. USG Corporation.
    d. Or Approved Equal.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Gypsum.
    b. Georgia-Pacific Gypsum LLC.
    c. PABCO Gypsum.
    d. Or Approved Equal.
2. Thickness: 1/2 inch.
3. Long Edges: Tapered.

2.4 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C1396/C1396M. Manufactured to have increased fire-resistive capability.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Gypsum.

b. CertainTeed Saint-Gobain.

c. Georgia-Pacific Gypsum LLC.

d. Or Approved Equal.

2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
3. Long Edges: Tapered.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
f. Expansion (control) joint.
g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Exterior Trim: ASTM C1047.

1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
2. Shapes:

a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.7 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: Vertical surfaces unless otherwise indicated.
2. Type X: Where required for fire-resistance-rated assembly.
3. Ceiling Type: Ceiling surfaces.
4. Type C: Where required for specific fire-resistance-rated assembly indicated.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 INSTALLATION OF EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 INSTALLATION OF TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges.
5. Curved-Edge Cornerbead: Use at curved openings.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Where indicated on Drawings.
3. Level 3: Where indicated on Drawings.
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

5. Level 5: Where indicated on Drawings.

a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ceramic mosaic tile.
2. Porcelain tile.

B. Related Requirements:
1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Face Size: Actual tile size, excluding spacer lugs.

C. Module Size: Actual tile size plus joint width indicated.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 36 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product.

D. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
2. Installer employs only Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers for Project.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Stone thresholds.
2. Waterproof membrane.
3. Crack isolation membrane.

4. Cementitious backer units.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

A. Porcelain Tile Type PRCTL-1: Unglazed.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Crossville, Inc., Gotham Series, or comparable product by one of the following:

    a. Daltile; a brand of Dal-Tile Corporation.
    b. Iris Ceramics U.S., a division of Stonepeak Ceramics, Inc.
    c. Seneca Tiles, Inc.
    d. Or Approved Equal.

2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 12 by 24 inches.
4. Face Size Variation: Rectified.
5. Thickness: 1/4 inch.
6. Face: Plain with square or cushion edges Retain "Dynamic Coefficient of Friction" Subparagraph below if required; ANSI A137.1 includes requirement below for tile used on surfaces of "commercial spaces that will be regularly walked on when wet."
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Tile Color, Glaze, and Pattern: Match Architect's sample.
9. Grout Color: As selected by Architect from manufacturer's full range.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

    a. Base: Coved, module size same as adjoining flat tile, 6 by 12 inches.
    b. Internal Corners: Field-butted square corners.

c. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch across nominal 4-inch dimension.

B. Glazed Wall Tile Type PRCTL-2:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Garden State Tile; Uptown Series, or comparable product by one of the following:

   a. Daltile; a brand of Dal-Tile Corporation.
   b. Seneca Tiles, Inc.
   c. Grupo Porcelanite.
   d. Or Approved Equal.

2. Module Size: 4 by 16 inches.
3. Face Size Variation: Rectified.
4. Thickness: 5/16 inch.
5. Face: Plain with modified square edges or cushion edges.
6. Finish: Gloss glaze.
7. Tile Color and Pattern: Match Architect's sample.
8. Grout Color: As selected by Architect from manufacturer's full range.
9. Mounting:

   a. Factory, back mounted.
   b. Pregrouted sheets of tiles are factory assembled and grouted with manufacturer's standard white silicone rubber.

10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
    a. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size 2 by 8 inches.
    b. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it, same size as adjoining flat tile.
    c. External Corners for Portland Cement Mortar Installations: Bullnose shape with radius of at least 3/4 inch unless otherwise indicated.
    d. External Corners for Thinset Mortar Installations: Surface bullnose, same size as adjoining flat tile.
    e. Internal Corners: Field-butted square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C1325, Type A, in maximum lengths available to minimize end-to-end butt joints.
   1. Thickness: 1/2 inch.

2.5 WATERPROOF MEMBRANES

A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.6 CRACK ISOLATION MEMBRANES

A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.7 SETTING MATERIALS

A. Standard Dry-Set Mortar (Thinset): ANSI A118.1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Laticrete International, Inc.
    b. MAPEI Corporation.
    c. Parex USA, Inc.
    d. Or Approved Equal.
2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.

2.8 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.

B. High-Performance Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ARDEX Americas.
    b. Laticrete International, Inc.
    c. MAPEI Corporation.
    d. Or Approved Equal.

2. Polymer Type:

    a. Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
    b. Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

C. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ARDEX Americas.
b. Laticrete International, Inc.
c. MAPEI Corporation.
d. Or Approved Equal.

2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless steel, ASTM A276/A276M or ASTM A666, 300 Series exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Schluter Systems L.P.
b. Blanke Corporation.
c. Ceramic Tool Company, Inc.
d. Or Approved Equal.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF CERAMIC TILE

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors consisting of tiles 8 by 8 inches or larger.
   b. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Glazed Wall Tile: 1/8 inch.
   2. Porcelain Tile: 1/4 inch.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

K. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 INSTALLATION OF TILE BACKING PANELS

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. TCNA F122 >: Thinset mortar on waterproof membrane.

    a. Ceramic Tile Type: PRCTL-1.
    b. Thinset Mortar: Modified dry-setmortar.
    c. Grout: High-performance sanded grout.

B. Interior Wall Installations, Wood or Metal Studs or Furring:

1. TCNA W244C or TCNA W244F : Thinset mortar on cementitious backer units or fiber-cement backer board.

a. Ceramic Tile Type: PRCTL-2.
b. Thinset Mortar: Standard dry-set mortar.
c. Grout: Water-cleanable epoxy grout.

END OF SECTION 093013

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 095133 - ACOUSTICAL METAL PAN CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Acoustical metal pans and associated suspension system for interior ceilings.

B. Products furnished, but not installed, under this Section include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include procedure for cutting metal pans.

B. Samples for Initial Selection: For units with factory-applied finishes.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:

1. Metal Pans: Set of full-size Samples of each type, finish, color, pattern, and texture. Show pan edge profile.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.
3. Sound Absorber: Sample of each type matching size of Sample metal pan.

D. Delegated Design Submittals: For design of seismic restraints and attachment devices.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.

5. Perimeter moldings.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical metal pan ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Evaluation Reports: For each acoustical metal pan ceiling suspension system and anchor and fastener type.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Metal Pans with Sound Absorber: Full-size units equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each grid, exposed molding, and trim equal to 2 percent of quantity installed.
3. Hold-Down Clips: Equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical ceiling area as indicated on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical metal pans, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they are protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Handle acoustical metal pans, suspension-system components, and accessories carefully to avoid damaging units and finishes in any way.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints and attachment devices.

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E1264 for Class B materials.
2. Smoke-Developed Index: 450 or less.

2.2 ACOUSTICAL METAL PANS, GENERAL

A. Source Limitations: Obtain each type of acoustical metal ceiling pan and supporting suspension system from single source from single manufacturer.

B. Acoustical Panel Standard: Provide manufacturer's standard pans of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E795.

C. Sheet Metal Characteristics: For metal components exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.

1. Aluminum Sheet: Rolled aluminum sheet, complying with ASTM B209; alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

D. Sound-Absorbent Pads: Provide width and length to completely fill concealed surface of pan, with surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing according to ASTM E84, and to comply with the following requirements:

1. Plastic Sheet-Wrapped, Mineral-Fiber Insulation: Pads consisting of nonrigid, PVC plastic sheet encapsulating unfaced mineral-fiber insulation complying with ASTM C553, Type I, Type II, or Type III, and as follows:

    a. Mineral-Fiber Type and Thickness: Glass fiber; 1 inch.
    b. Mineral-Fiber Density: 3/4 lb/cu. ft..
2. Spacer Grids: Provide manufacturer's standard aluminum grid units that provide an air cushion between metal pans and insulation pads and that act to improve sound absorption.

E. Adhesive: Manufacturer's standard nonflammable adhesive for sound-absorbent pads.

2.3 ALUMINUM PANS FOR ACOUSTICAL METAL PAN CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation, Celebration, or comparable products by one of the following:
1. Armstrong Ceiling & Wall Solutions.
2. Certainteed; SAINT-GOBAIN
3. Rockfon; ROCKWOOL International.
4. Or Approved Equal.

B. Classification: Units complying with ASTM E1264 for Type VII, perforated aluminum facing (pan) with mineral- or glass-fiber-base backing.
1. Pattern B: (Perforated, small holes) regularly spaced, with uniform perforations of dimension, holes per square foot or inch, and percent open area as selected from manufacturer's full range.

C. Pan Fabrication: Manufacturer's standard units of size, profile, and edge treatment indicated, formed from metal indicated and finished to comply with requirements indicated.

1. Lay-in Pans: Formed to set in exposed suspension grid.
2. Torsion-Spring-Hinged Pans: Designed to be securely retained in preslotted, exposed suspension grid by torsion springs provided by manufacturer.

D. Pan Thickness: Not less than 0.025 inch.

E. Pan Edge Detail: Manufacturer's standard edge detail.

F. Pan Joint Detail: Narrow reveal, not greater than 9/16 inch wide.

G. Pan Size: As indicated on Drawings.

H. Pan Face Finish: Painted in color selected from manufacturer's full range.

I. Light Reflectance Coefficient: Not less than 0.70.

J. NRC: Not less than] 0.80 .

K. Ceiling Attenuation Class: Not less than 40.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C635/C635M requirements.

B. Suspension Systems: Provide systems complete with carriers, runners, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, and other suspension components required to support ceiling units and other ceiling-supported construction.

C. Attachment Devices: Size for 5 times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated. Comply with seismic design requirements.

D. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.

E. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.

F. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
2. Stainless Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
3. Nickel-Copper-Alloy Wire: ASTM B164, nickel copper alloy for UNS No. N04400 alloy.
4. Size: Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C635/C635M, Table 1, Direct Hung, is less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

G. Hold-Down Clips: Manufacturer's standard hold-down clips spaced to secure acoustical metal pans in place at each pan.

H. Exposed Metal Edge Moldings and Trim: Provide exposed members as indicated or as required to comply with seismic requirements of authorities having jurisdiction, to conceal edges of and penetrations through ceiling, to conceal edges of pans and runners, for fixture trim and adapters, for fasciae at changes in ceiling height, and for other conditions; of metal and finish matching acoustical metal pan ceiling units unless otherwise indicated.

1. For Circular Penetrations of Ceiling: Fabricate edge moldings to diameter required to fit penetration exactly.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL, STANDARD-GRID METAL PAN CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation;, or comparable product by one of the following:
   1. Armstrong Ceiling & Wall Solutions.
   2. Certainteed; Saint-GOBAIN.
   3. Rockfron; ROCKWOOL International.
   4. Or Approved Equal.

B. Suspension System: For lay-in torsion-spring-hinged pans.

   1. Wide-Face, Capped, Double-Web, Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytic zinc-coated or hot-dip galvanized according to ASTM A653/A653M, G30 coating designation, with prefinished, cold-rolled, 15/16-inch-wide, sheet metal caps on flanges.

      a. Structural Classification: Intermediate-duty system.
      b. End Condition of Cross Runners: Override (stepped) or butt-edge type.
      c. Face Design: Flat, flush.
      d. Cap Material: aluminum cold-rolled sheet.
      e. Cap Finish: Painted in color as selected from manufacturer's full range

   2. Suspension System for Torsion-Spring-Hinged Metal Pans: Provide runners with factory-cut slots fabricated to accept torsion-spring-hinged attachment.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. High-Humidity Finish: Comply with ASTM C635/C635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

2.7 ALUMINUM FINISHES

A. Color-Coated Finish: Manufacturer's standard powder-coat baked paint complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical metal pan ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical metal pan ceilings.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width pans at borders, and comply with layout shown on reflected ceiling plans and coordination drawings.

3.3 INSTALLATION

A. General: Install acoustical metal pan ceiling assemblies to comply with ASTM C636/C636M, seismic design requirements, and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members or carrying channels and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that do not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8.

9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members or carrying channels and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical metal pans.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Cut acoustical metal pan units for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet. Cut and treat edges to comply with manufacturer's written instructions.

G. Install acoustical metal pans in coordination with suspension system and exposed moldings and trim. Comply with manufacturer's installation tolerances.

1. For lay-in, square-edge pans, install pans with edges fully hidden from view by flanges of suspension-system runners and moldings.
2. For torsion-spring-hinged pans, position pans according to manufacturer's written instructions.
3. For snap-in pans, fit adjoining units to form flush, tight joints.
4. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
5. Fit adjoining units to form flush, tight joints.
6. Install directionally patterned or textured metal pans in directions indicated.
7. Install sound-absorbent fabric layers in, and bond to, perforated metal pans.

H. Install sound attenuation panels in areas indicated by reflected ceiling plans or room finish schedules. Lay panels directly on ceiling system and close major openings to form complete coverage in required areas. Lay second sound-absorbent pads on sound attenuation panels.

I. Install hold-down clips where indicated.

3.4 CLEANING

A. Clean exposed surfaces of acoustical metal pan ceilings, including trim and edge moldings, after removing strippable, temporary protective covering, if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION 095133

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Thermoplastic-rubber base.
   2. Rubber stair accessories.
   3. Rubber molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

D. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

   1. Coordinate mockups in this Section with mockups specified in other Sections.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Nora by Interface.
2. Roppe Corporation.
3. Armstrong World Industries, Inc.
4. Or Approved Equal.

B. Product Standard: ASTM F1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous) or II (layered).
2. Style and Location:

a. Style A, Straight: Provide in areas with carpet.
b. Style B, Cove: Provide in areas with resilient floor coverings.

C. Height: 4 inches.

D. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.

E. Outside Corners: Job formed or preformed.

F. Inside Corners: Job formed or preformed.

G. Colors: As selected by Architect from manufacturer’s full color range.

2.2 RUBBER STAIR ACCESSORIES

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Roppe Corporation.
2. Nora by Interface
3. Armstrong World Industries, Inc.
4. Or Approved Equal.

C. Stair Treads: ASTM F2169.

1. Type: TS (rubber, vulcanized thermoset).
2. Class: 2 (pattern; embossed, grooved, or ribbed).
3. Group: 1 (embedded abrasive strips).
4. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
5. Nosing Height: 2 inches.
6. Thickness: 1/4 inch and tapered to back edge.
7. Size: Lengths and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.

D. Separate Risers: Smooth, flat; in height that fully covers substrate; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

1. Style: Coved toe, 7 inches high by length matching treads.
2. Thickness: Manufacturer's standard.

E. Stringers: Height and length after cutting to fit risers and treads and to cover stair stringers, produced by same manufacturer as treads, and recommended by manufacturer for installation with treads.

1. Thickness: Manufacturer's standard.

F. Landing Tile: Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

G. Locations: Provide rubber stair accessories in areas indicated.

H. Colors and Patterns: As selected by Architect from manufacturer's full range of color and patterns.

2.3 RUBBER MOLDING ACCESSORY

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Roppe Corporation.
2. VPI Corporation.
3. Armstrong World Industries, Inc.
4. Or Approved Equal.

B. Description: Rubber stair-tread nosing carpet edge for glue-down applications transition strips.

C. Profile and Dimensions: As indicated.

D. Locations: Provide rubber molding accessories in areas indicated.

E. Colors and Patterns: As selected by Architect from manufacturer's full range of colors and patterns.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

D. Metal Edge Strips: Extruded aluminum with mill finish, nominal 2 inches wide, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

    a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

    a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from resilient stair treads before applying liquid floor polish.

1. Apply two coat(s).

E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 0966 23.16 – EPOXY-RESIN TERRAZZO FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes.

1. Thin-set epoxy terrazzo.

2. Precast, thin-set, epoxy terrazzo wall base units.
3. Related accessories.

B. Related Requirements:
1. Section 079200, Joint Sealants.

1.3 REFERENCES

A. American Concrete Institute (ACI):

1. ACI Committee No. 403 Bulletin Title No. 59-43.

B. American Society for Testing and Materials (ASTM):

1. ASTM C131 "Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine."
2. ASTM C140 "Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units."
3. ASTM C373 "Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products."
4. ASTM C1021 Standard Practice for Laboratories Engaged in the Testing of Building Sealants."
5. ASTM D412 "Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension."
6. ASTM D638 "Standard Test Method for Tensile Properties of Plastics."
7. ASTM D695 "Standard Test Method for Compressive Properties of Rigid Plastics."
8. ASTM D696 "Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer."
9. ASTM D1308 "Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes."
10. ASTM D2240 "Standard Test Method for Rubber Property—Durometer Hardness."
11. ASTM D2370 "Standard Test Method for Tensile Properties of Organic Coatings."
12. ASTM E96 "Standard Test Methods for Water Vapor Transmission of Materials."
13. ASTM F1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride."

14. ASTM F2170 "Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.".

C. The International Accreditation Service (IAS)

1. IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC Standard 17025.

D. International Concrete Repair Institute (ICRI):

1. "Technical Guidelines 03732: Guide for Selecting and Specifying Surface Preparation for Sealers, Coatings, and Membranes."

E. The International Laboratory Accreditation Cooperation (ILAC).

1. IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC Standard 17025.

F. International Masonry Institute (IMI).

G. International Organization for Standardization (ISO):

1. ISO 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

H. The National Terrazzo & Mosaic Association Inc. (NTMA):

1. “Terrazzo Specifications and Design Guide”
2. “Guide Specification for Epoxy Terrazzo”.
3. Technical Bulletin #111.

1.4 DEFINITIONS

A. Recycled Content: Recycled content is defined in accordance with the International Organization of Standards document, ISO 14021 — Environmental labels and declarations — Self-declared environmental claims (Type II environmental labeling).

1. Preconsumer Recycled Material: Material diverted from the waste stream during the manufacturing process. Reutilization of materials (i.e., rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it) is excluded.
2. Postconsumer Recycled Material: Waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.

B. VOC: Volatile Organic Chemical

1.5 COORDINATION

A. Coordinate the types of traffic allowed on terrazzo between the following events:\

1. Completion of pouring and before coarse grinding.
2. Completion of grouting and before polishing.

B. Coordinate the preparation for terrazzo work with the installation of plumbing, electrical, communications, and data work in the floor area to receive terrazzo.

1. Verify that fixtures, equipment, and outlets will be located properly and at the correct elevation.

1.6 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section. Review methods and procedures related to terrazzo including, but not limited to, the following:

1. Inspect and discuss installation procedures, joint details, jobsite conditions, substrate specification, vapor barrier details and coordination with other trades.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.
3. Review special terrazzo designs and patterns.
4. Review dust control procedures.
5. Review plans for concrete curing and site drying to enable timely achievement of suitable slab moisture conditions.
6. Review concrete substrate tolerance requirements for acceptable terrazzo installation.

1.7 SUBMITTALS

A. Product Data: Manufacturer's product data for each type of terrazzo and accessory including the following information:

1. Physical properties.
2. Performance properties.
3. Independent Lab Testing for Moisture Mitigation System and Bond Strength Testing
4. For tests not listed in published data, supply missing data according to standard referenced.

B. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details and attachments to other work. Show layout of the following:

1. Divider strips.
2. Control- and expansion-joint strips.
3. Base and border strips.
4. Abrasive strips.
5. Stair treads, risers and landings.
6. Precast terrazzo-jointing and edge configurations including anchorage details.
7. Terrazzo patterns.
8. Layout of special graphic patterns.
9. Large scale details of terrazzo patterns and metal or other material inserts.

C. Samples for Initial Selection: Provide Manufacturer's color plates showing the full range of colors and patterns available for each terrazzo type indicated.

D. Samples for Verification: For each type, material, color and pattern of terrazzo and accessory required showing the full range of color, texture and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes and proportions. Prepare samples of same thickness and from same material to be used for the Work in size indicated below:

1. Epoxy Terrazzo: minimum 6” x 6” sample of each color and type of terrazzo.
2. Precast Epoxy Terrazzo: minimum 6” x 6”sample of each color and type of terrazzo.
3. Accessories: 6” length of each kind of divider strip, stop strip and control joint strip required.

E. Coordination Drawings: Provide floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. <Insert requirements>.

F. Qualification Data: For Installer and Manufacturer.

G. Material Certificates: For each type of terrazzo flooring system product, provide supplier or manufacturer's written certificate stating that materials comply with or exceed NTMA specified properties and performance requirements of this Section.

H. Material Test Reports: For moisture and/or relative humidity of substrate, by a qualified testing agency.

I. Precast Terrazzo Flooring Test Reports: Provide test reports for precast terrazzo flooring, for the following tests performed by manufacturer and witnessed by a qualified testing agency:

1. Compressive Strength: ASTM D695.
2. Water Absorption: ASTM C373/ASTM C140.
3. Flexural Strength: ASTM D638.
4. Tensile Strength: ASTM D638.

J.

K. Sample Warranties: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: NTMA maintenance recommendations and manufacturer’s instructions to include in maintenance manuals.

B. Repair Procedures: Provide written procedures for the following:

1. Epoxy Terrazzo Flooring: Removal and replacing damaged portions of flooring.
2. Precast Terrazzo Flooring: Removing individual precast units and replacing them.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage a terrazzo manufacturer with documented manufacturing experience producing epoxy binder, and flexible crack isolation membranes; including the following:

1. Furnish documentation for epoxy terrazzo projects of the same scope and complexity; installed using material being submitted for this project.
2. For each epoxy terrazzo project submitted, provide the following information:

1) Project name.
2) Square footage of terrazzo installed.

3) Lineal footage of precast base and cast in place base.
4) Address of facility with contact name and phone number.
5) Contact name, address and phone number of prime contractor or construction manager.
6) Field experience resumes of key project personnel including lead supervisor and field technicians to be used on this project.

B. Installer Qualifications: Submit a letter recognizing that they are a qualified installer in good standing and is acceptable to epoxy terrazzo manufacturer.

1. Furnish documentation for epoxy terrazzo projects of the same scope and complexity; installed using material being submitted for this project.
2. For each epoxy terrazzo project submitted, provide the following information:

1) Project name.
2) Square footage of terrazzo installed.
3) Lineal footage of precast base and cast in place base.
4) Address of facility with contact name and phone number.
5) Contact name, address and phone number of prime contractor or construction manager.
6) Field experience resumes of key project personnel including lead supervisor and field technicians to be used on this project.

3. For each epoxy terrazzo project submitted, provide the following information:

C. Precast Terrazzo Flooring Fabricator Qualifications: Shop that employs skilled workers who custom fabricate precast terrazzo flooring products similar to those required for this Project and whose products have a record of successful in-service performance .

1. Furnish a list of precast terrazzo flooring projects using material being submitted for this project installed of the same scope, complexity and at least 50 percent of the square footage.

D. Testing Agency Qualifications: Qualified according to ASTM C1021 ASTM C1093 for testing indicated.

E. Mockups: Build mockups to verify selections made under sample submittals; to demonstrate aesthetic effects; and to set quality standards for materials and execution.

1. Build mockup of typical terrazzo flooring installation in location directed by Architect.

1) Size: Minimum 100 sq. ft. of typical poured-in-place flooring and base condition for each color and pattern in locations directed by Architect.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's undamaged, unopened containers with a label on each container clearly marked with the following information:

1. Product name
2. Manufacturer's name
3. Component designation (A or B, etc.)
4. Ratio of component mixture
5. CHEMTREC Emergency Response Information

B. Handle materials by methods which prevent damage.

C. Inspect direct jobsite deliveries to assure quantities are correct; materials comply with requirements; and materials are not damaged.

D. Immediately return materials found to be defective in manufacturing and materials damaged in transit, handling or storage.

1. Replace defective materials at no cost to Owner.

E. Store materials per manufacturer's instructions and as follows:

1. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures and humidity.
2. Maintain storage temperatures between 60° F and 90° F.
3. Maintain seals and labels intact and legible.
4. Do not use materials which have been stored for a longer period of time than the manufacturer's maximum recommended shelf life.

F. Precast Terrazzo Protective Wrapping: Wrap precast units individually in a nonstaining protective cover and mark each unit for proper identification of installation location.

1.11 FIELD CONDITIONS

A. Temperature:

1. Maintain the ambient room and substrate temperature at 55° F or above during stripping and pouring.

a. Maintain this temperature at least 48 hours after completion of pouring.

2. After terrazzo has been poured, maintain substrate temperature at 40° F or above until substantial completion.
3. Each day of installation, before beginning work, verify that the dew point is at least 5° F less than the slab and air temperature.

B. Verify that adequate ventilation is provided.

C. Maintain a minimum uniform level of 50-60 foot candles (538.2 Lux – 645.8 Lux) in areas where terrazzo system is being installed.

D. Field Measurements, Precast Terrazzo: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.

E. Acceptable Substrate Conditions:

1. Flatness Tolerance: Maximum variation from flatness of 1/4 inch in 10 feet).
2. Concrete floor Finish: Steel trowel finish.
3. Allow concrete to receive epoxy terrazzo to cure for at least 30 days before beginning installation process.

    a. Allow no curing agents to be used in areas to receive terrazzo.

4. Test concrete substrate to determine acceptable moisture levels prior to terrazzo installation.
5. Saw cutting of control joints must be done between 12 and 24 hours after placement of the structural concrete and at a frequency compatible to ACI recommendations.

F. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.

G. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.

H. Provide protection from other trades prior to final acceptance by owner.

I. Dust Control: Control and collect dust produced by grinding operations. Comply with requirements of Section 015000 Temporary Facilities and Controls.

1.12 WARRANTY

A. Special Warranty: Manufacturer and installer, jointly, agree to provide labor and material to repair (and if necessary to replace) components of epoxy terrazzo flooring system that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, loss of bond and damage due to normal wear and tear.
2. Failures do not include the following:

    1) Damage due to bubbling or loss of adhesion due to moisture penetration through the substrate.
    2) Acts of God or other elements beyond scope of protection of this system.
    3) Reflective cracks from substrate.

3. Warranty Period: Five years from date of Substantial Completion.
4. Limitations:

    1) In case of warranty claim, Owner will provide written notice to terrazzo manufacturer and installer within 30 days of problem's discovery.
    2) Owner will provide free access to area during normal working hours.
    3) Owner assumes responsibility for protection and maintenance of epoxy terrazzo flooring from date of Substantial Completion on.
    4) Remedies provided by epoxy terrazzo flooring manufacturer and installer are limited to direct repair of Epoxy Terrazzo Flooring System.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products by Concord Terrazzo Company Inc., or comparable products by one of the following:

1. Master Terrazzo Technologies.
2. Sika AG.
3. Dex-O-Tex.
4. Or Approved Equal.

B. Source Limitations: Obtain primary Epoxy Terrazzo Flooring System materials including membranes, primers, resins, and hardening agents from a single manufacturer.

1. Obtain aggregates, solvents, divider strips, sealers and cleaners from source recommended by primary materials manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

2.3 EPOXY TERRAZZO FLOORING SYSTEM

A. Materials:

1. Epoxy Resin: Manufacturer’s standard recommended for use indicated and in color required for mix indicated.

a. Physical Properties without Aggregates:

1) Hardness: ASTM D2240 70-85 Shore D
2) Minimum Tensile Strength: 4,800 psi per ASTM D638 for a 2-inch specimen made using a “C” die per ASTM D412.
3) Minimum Compressive Strength: 12,000 psi per ASTM D695, Specimen B cylinder.
4) Chemical Resistance: No deleterious effects by contaminants listed below after 7-day immersion at room temperature per ASTM D1308.

a) Distilled water
b) Mineral water
c) Isopropanol
d) Ethanol
e) 0.025 percent detergent solution
f) 1 percent soap solution
g) 10 percent sodium hydroxide
h) 10 percent hydrochloric acid
i) 5 percent acetic acid

b. Physical Properties with Aggregates: For resin blended with Georgia White marble, ground, grouted, and cured per requirements in NTMA's "Guide Specification for Epoxy Terrazzo," comply with the following:

1) Flammability: Self-extinguishing, maximum extent of burning 0.25 inch per ASTM D635.
2) Linear Coefficient of Thermal Expansion: 25.0x10-6 in/in per ºF for temperature range of -12° to 140° F per ASTM D696.
3) Bond Strength: When tested in accordance with Field Test Method for surface soundness and adhesion as described in ACI Committee No. 403 Bulletin Title No. 59-43 the Epoxy terrazzo shall comply with the following value: 100 percent concrete failure minimum, with 300 psi minimum tensile strength.

2. Marble Chips: Synthetic:

a. Sizes: #2's, #1's and #0's, conforming to NTMA gradation standards.
b. Abrasion and Impact Resistance: ASTM C131-89; maximum 40 percent loss.
c. Chips shall contain no deleterious or foreign matter.

B. Mix: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.

1. Color and Pattern Schedule: Where the following designations are indicated, provide specified terrazzo matrices matching architect's samples:

2.4 PRECAST TERRAZZO UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Concord Terrazzo Company, Inc.
2. Precast Terrazzo Enterprises.
3. Romoco Precast Terrazzo Products.
4. Wausau Tile.
5. Or Approved Equal.

B. Precast Wall Base Units: Precast epoxy terrazzo covebase units, 3/8 inch thick, unless otherwise indicated with 3/4 inch radius cove; cast in maximum lengths possible, but not more than 48 inches .

1. Configuration: As selected by the Architect from full range of manufacturer's standard units.

2. Height: As indicated on Drawings.
3. Outside Corner Units: With finished returned edges at outside corner.
4. Colors and Patterns: As selected by Architect from manufacturer's full range.

C. Toe Strips for Precast Wall Base: L-type or T-type strips to fit cove base units in depth required for topping thickness indicated.

1. Material: To match divider strips.
2. Top Width: To match divider strips.

2.5 DIVIDER AND ACCESSORY STRIPS

A. Thin –Set Divider Strips: L-type and T-type.

1. Material: half hard brass or plastic, in color selected from manufacturers product range.
2. Top Width: 1/16 inch .

B. Control joint Strips: Separate, double L-type divider strips, positioned back to back with 3/8 inch) separation filled will sealant.

C. Accessory Strips: Match divider-strip width, material, and color unless otherwise indicated. Provide the following types of accessory strips:

1. Base bead and base dividers.
2. Edge beads for exposed edges of terrazzo.

2.6 MISELLANEOUS PRODUCTS

A. Concrete Patch and Topping: 100 percent solids fill mortar system including blended aggregate.
1. Compressive Strength: ASTM C579, 8,000 psi minimum.
2. Hardness: ASTM D2240, 75-80 Shore D

B. Primer: 100 percent solids, epoxy primer moisture insensitive. No solvent containing primers are allowed
1. Moisture Vapor Transmission: ASTM E96, 1 perm maximum.

C. Crack Isolation Membrane
1. Flexible Epoxy Membrane: Flexible epoxy membrane with 100 percent solids with the following properties:

a. Tensile Strength: ASTM D2370 at 68° F 1,500 psi .
b. Elongation: ASTM D2370 at 68° F 130 percent.
c. Adhesion: ASTM D4541, 350 psi .

D. Divider-Strip Adhesive: Epoxy-resin adhesive recommended by adhesive manufacturer for this use and acceptable to terrazzo manufacturer.

1. Use adhesive that has a VOC content of 50g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Anchoring Devices:

1. Strips: Provide mechanical anchoring devices for strip materials as required for secure attachment to substrate.
2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by Terrazzo Contractor for proper anchorage and support of units for conditions of installation and support.

F. Finishing Grout: Epoxy grout with 100 percent Solids.

G. Control Joint Filler: Flexible, grindable, epoxy joint filler, 100 percent solids, with the following properties:
1. Tensile Strength: ASTM D2370 at 68° F 1,600 psi

2. Elongation: ASTM D2370 at 68° F 100 percent
3. Tensile Modulus: ASTM D2370 at 68° F 27,800 psi
4. Color: As selected by the Architect.

H. Joint Sealant: Comply with requirements of Section 079000 "Joint Sealants."

I. Expansion Joints: Comply with requirements of Section 079000 "Joint Sealants".

J. Abrasive Strips: Metal channels matching strips to receive epoxy and abrasive aggregate.

1. Barrier free profile, extruded aluminum base and anchor for casting into concrete fill, aluminum oxide blend abrasive filled, ribbed style with anti-slip surface, color as selected; 3 inches wide by 1/8 inch less the tread width long.

K. Terrazzo Cleaner: As recommended by cleaner manufacturer for use on terrazzo type specified and as follows:

1. Biodegradable
2. Chemically neutral
3. pH factor between 7 and 10
4. Free from phosphate, crystallizing salts, and water soluble alkaline salts.

L. Terrazzo Sealers: Slip- and stain-resistant sealer that is chemically neutral with a pH factor between 7 and 10, a standard coefficient of friction of 0.6 or higher, does not affect physical properties of terrazzo and complies with NTMA's "Terrazzo Specifications and Design Guide."

1. General: Provide sealers produced by or approved by terrazzo flooring system manufacturer.
2. Water Based Sealer: Provide a medium gloss water based sealer and finish system.

2.7 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate epoxy terrazzo flooring.

B. Testing: Test and inspect epoxy terrazzo flooring according to the following requirements:

1. Cure specimens for 7 days at 75° F plus or minus 2° F and 50 percent plus or minus 2 percent RH.
2. Conduct tests according to the test methods indicate for each product and characteristic indicated above in Part 2 of this Section.

C. Epoxy terrazzo flooring will be considered defective if it does not pass tests and inspections.

1. Acceptable results for each product and characteristic indicated above in Part 2 of this Section.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas, with Terrazzo Contractor present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Evaluate slab condition, including slab moisture content and extent of repairs required to comply with substrate requirements of NTMA's "Terrazzo Specifications and Design Guide" and the requirements of this Section.
2. Verify that concrete substrate was poured no fewer than 30 days prior to date of examinations.
3. Verify existing work has no defects affect proper execution of terrazzo work.
4. Verify that concrete substrate meets flatness tolerances.
5. Verify that concrete substrates are visibly dry and free of moisture.

B. Proceed with installation only after unsatisfactory conditions, including flatness tolerances, have been corrected.

C. Verify measurements and dimensions; coordinate the installation of insert and work of other trades.

3.2 PREINSTALLATION TESTING

A. Concrete Moisture Testing, General

1. Conduct relative humidity test at each test site.
2. Conduct one pH test at each test site.

B. Calcium Chloride Testing:

1. Perform tests in accordance with ASTM F1869.

C. Relative Humidity Testing:

1. Perform tests in accordance with ASTM F2170.
2. Conduct relative humidity testing at the following depths:
   a. Elevated Slabs: Measure temperature and relative humidity at 20 percent of slab thickness measured from top surface.

3. Drill test hole at each test site to accommodate test sleeve.
4. Hole Diameter: In accordance with test equipment manufacturer's instructions.
5. Drilling Fluids: Not permitted.
6. Vacuum dust and debris from test hole.
7. Insert sleeve, to the full depth of test hole. Cap or plug sleeve to prevent test hole contamination.
8. Permit the test site to acclimate for minimum 72 hours before measuring relative humidity.
9. Remove sleeve plug and insert probe to bottom of test hole. Allow test probe to reach temperature equilibration with concrete slab.
10. Measure and record temperature and relative humidity at the test site.

D. Proceed with terrazzo installation only after substrates have a maximum relative humidity measurement reading less than 80 percent.

1. If concrete substrate moisture exceeds 80% according to ASTM F2170, consult terrazzo manufacturer for additional drying or negative side moisture remediation methods.

3.3 PREPARATION

A. Clean substrates of substances, including oil, grease and curing compounds, that might impair terrazzo bond. Provide clean, dry and neutral substrate for terrazzo application.

B. Provide clean, dry, and neutral substrate for terrazzo application.

1. Determine dryness characteristics by performing moisture tests recommended by terrazzo manufacturer.

C. Concrete Slabs:

1. Provide sound concrete surface free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil and other contaminants incompatible with epoxy terrazzo.

a. Prepare concrete mechanically by shot blasting or by grinding.

1) Surface preparation results should achieve a CSP3-CSP4 profile according to International Concrete Repair Institute Guideline No. 03732.

b. Remove contaminating and bond breaking substances including but not limited to the following:

1) Dust.
2) Laitance.
3) Curing compounds.
4) Coatings.
5) Sealers.
6) Oil.
7) Grease.
8) Mastics.
9) Adhesives.

c. Chemically remove oil and grease not removed by vacuum blasting.
d. Mechanically remove spalled and deteriorated concrete with scabbling or chipping hammers.
e. Do not acid etch concrete.
f. Repair or level damaged concrete with concrete patch and topping.
g. Do not use latex fills and self leveling underlayments.
h. Cracks and non-expansion joints greater than 1/16 inch wide after surface preparation shall be prepared until sound.

1) Repair cracks and non-expansion joints according to NTMA Technical Bulletin #111.

D. Protect other work from dust generated by shot blasting and by grindingoperations. Control dust to prevent air pollution and comply with environmental protection regulations.

1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

E. Protect other work from dust generated by grinding operations. Control dust to prevent air pollution and comply with environmental protection regulations.

1. Erect and maintain temporary enclosures and other suitable methods to limit dust migration and to ensure adequate ambient temperatures and ventilation conditions during installation.

F. Apply one coat of moisture remediation system over concrete surface prepared to receive epoxy-resin terrazzo flooring according to manufacturer's written instructions.

3.4 INSTALLATION, EPOXY TERRAZZO

A. General:

1. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type and accessory indicated unless more stringent requirements are specified within this section.
2. Comply with written directions of product manufacturer.
3. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control joint strips.
4. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted.

B. Full Membrane Application

1. Flexible Reinforcing Membrane:

a. Prepare and prefill substrate cracks with concrete patch and topping material or with primer and allow to cure.
b. Apply 25 mils of crack isolation membrane over prepared substrate to produce full substrate coverage in areas to receive terrazzo.
c. Apply second coat of crack isolation membrane, 15 mils thick and install reinforcing fabric.
d. Prepare membrane according to manufacturer's written instructions before applying primer.

2. Primer: Install primer if required by manufacturer over crack isolation membrane.

C. Crack Detailing Application

1. Crack Treatment Type 1: After surface preparation, fill less than 1/16 inch wide with crack isolation membrane. Apply detail coat of crack isolation membrane over cracks and embed 12 inches wide strips of membrane reinforcing fabric.
2. Primer: Apply epoxy primer evenly over entire prepared substrate, including cracks and non-expansion joints, at a rate of 200-250 square feet per gallon .

a. Thoroughly wet surface with primer.
b. Do not allow primer to pond.

D. Divider and Accessory Strips: Install in locations indicated in adhesive setting bed without voids below strips.

1. Anchoring Strips: Adhere the strips to the floor with primer or hot glue.

E. Control Joint Strips: Provide one of the following:

1. Back to Back Strips: Install L-type divider strips back to back over full membrane parallel to control and non-doweled construction joints leaving a space appropriate for anticipated movement - typically 1/4 to 3/8 inch according to NTMA Technical Bulletin #111, Detail #1.

a. Fill gap between control joints with joint sealant.

2. Single Strip: Fill saw cut joint with control joint filler. Place L-type divider strip on concrete adjacent to joint according to NTMA Technical Bulletin #111, Detail 2.

3. Buried Joint: Fill saw cut joints with control joint filler and cover with crack isolation membrane with embedded membrane reinforcing fabric according to NTMA Technical Bulletin #111, Detail 3.

F. Placing Terrazzo:

1. Mix terrazzo binder with chips and fillers in ratios as approved by manufacturer.
2. Trowel-apply terrazzo mixture over epoxy primer to provide smooth seamless surface at a minimum of 3/8 inch thick.

a. Allow terrazzo mixture to cure per manufacturer's recommendations prior to grinding operations.

G. Rough Grinding: Grind with 24 grit or finer stones or with comparable diamond plates.

H. Intermediate Grinding: Follow initial grind with 80 grit or finer stones .

I. Grouting: Prior to final grinding, apply epoxy grout as follows:

1. Cleanse floor with clean water and rinse thoroughly.
2. Remove excess rinse water by wet vacuum and machine until completely dry.
3. Apply epoxy grout to fill voids.

J. Fine Grinding: Grind with 120 grit or finer stones until all grout is removed from surface.

1. Repeat rough grinding, grout coat, and fine grinding if large voids exist after initial fine grinding.
2. Produce surface with a minimum of 70 percent aggregate exposure.

K. Remove terrazzo in areas where terrazzo fails to bond properly to substrate and install new terrazzo.

1. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo.

L. Construction Tolerances: Limit variation in terrazzo surface from level 1/4 inch in 10 feet .

3.5 INSTALLATION, PRECAST TERRAZZO

A. Set units using method recommended by NTMA and by epoxy terrazzo flooring manufacturer unless otherwise indicated.

B. Set units with alignment level and true to dimensions, varying 1/8 inch (3.2 mm) maximum in length, height, or width.

C. Seal joints between units with joint sealants.

3.6 ADJUSTING

A. Cut out and replace terrazzo areas that evidence lack of bond with substrate. Cut out terrazzo areas in panels defined by strips and replace to match adjacent terrazzo, or repair panels according to NTMA's written recommendations, as approved by Architect.

3.7 CLEANING

A. Cleaning:

1. Wash surfaces with cleaner according to NTMA's Maintenance Guide and manufacturer's written instructions.
2. Remove grinding dust from installation and wash surfaces according to manufacturers recommended cleaning procedures.
3. Allow surfaces to thoroughly dry before sealing.

3.8 PROTECTION

A. Protect surrounding substrates and surfaces, as well as in-place equipment from damage during surface preparation and system application.

B. Maintain area where terrazzo work is being done be free of other trades during surface preparation, crack detailing, divider strip installation, terrazzo pouring, and for a period of 36 hours upon completion.

C. Sealing:

1. Seal surfaces according to NTMA's written recommendations.
2. Apply terrazzo sealer according to sealer manufacturer's written instructions.

D. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure terrazzo is without damage or deterioration at time of Substantial Completion.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Modular carpet tile.

B. Related Requirements:
1. Section 096513 "Resilient Base and Accessories" resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.

5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples for Initial Selection: For each type of carpet tile.

1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.

D. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

F. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Carpet and Rug Institute's CRI 104.

1.10 FIELD CONDITIONS

A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.
d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE CRPTL-1

A. Basis-of-Design Products: Subject to compliance with requirements, provide Interface, Inc; Broome Street or a comparable product by one of the following:

1. Mohawk Carpet, LLC; The Mohawk Group.
2. Shaw Industries Group, Inc.; Berkshire Hathaway Group.
3. Tandus, a Tarkett Company.
4. Or Approved Equal.

B. Color: As selected by Architect from manufacturer's full range.

C. Pattern: Non Directional.

D. Fiber Content: 100 percent nylon 6, 6.

E. Pile Characteristic: Level-loop pile.

F. Density: 10,957.00 oz./cu. yd. .

G. Pile Thickness: 0.09 for finished carpet tile according to ASTM D6859.

H. Stitches: 9.00 stitches per inch.

I. Gage: 1/10 ends per inch.

J. Total Weight: 28.00 oz./sq. yd. for finished carpet tile.

K. Primary Backing/Backcoating: Manufacturer's standard composite materials.

L. Secondary Backing: Manufacturer's standard material.

M. Size: 24 by 24 inches.

N. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.
2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:

a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

O. Performance Characteristics:

1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
3. Dry Breaking Strength: Not less than 100 lbf according to ASTM D2646.
4. Tuft Bind: Not less than 5 lbf according to ASTM D1335.
5. Delamination: Not less than 3.5 lbf/in. according to ASTM D3936.
6. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
8. Noise Reduction Coefficient (NRC): .65 according to ASTM C423.
9. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
10. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, Option E.
11. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.2 CARPET TILE CRPTL-2

A. Basis-of-Design Product: Subject to compliance with requirements, provide Interface, Inc.; Old Street or comparable product by one of the following:

1. Mohawk Carpet, LLC; The Mohawk Group.
2. Shaw Industries Group, Inc.; Berkshire Hathaway Company.
3. Tandus, a Tarkett Company.
4. Or Approved Equal.

B. Color: As selected by Architect from manufacturer's full range .

C. Pattern: Non Directional.

D. Fiber Content: 100 percent nylon 6, 6.

E. Pile Characteristic: Level-loop pile.

F. Density: 10,957.00 oz./cu. yd. .

G. Pile Thickness: 0.09 inches for finished carpet tile according to ASTM D6859.

H. Stitches: 9.00 stitches per inch.

I. Gage: 1/10 ends per inch.

J. Surface Pile Weight: 28.00 oz./sq. yd..

K. Primary Backing/Backcoating: Manufacturer's standard composite materials.

L. Secondary Backing: Manufacturer's standard material.

M. Size: 19.69 by 19.69 inches.

N. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.
2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:

    a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

O. Performance Characteristics:

1. Appearance Retention Rating: Heavy traffic, 3.0 minimum according to ASTM D7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
3. Dry Breaking Strength: Not less than 100 lbf according to ASTM D2646.
4. Tuft Bind: Not less than 5 lbf according to ASTM D1335.
5. Delamination: Not less than 3.5 lbf/in. according to ASTM D3936.
6. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
8. Noise Reduction Coefficient (NRC): .65 according to ASTM C423.
9. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
10. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, Option E.
11. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with manufacturer requirements and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Wood Subfloors: Verify the following:

1. Underlayment over subfloor complies with requirements specified in Section 061600 "Sheathing."
2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

E. Metal Subfloors: Verify the following:

1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with the Carpet and Rug Institute's CRI 104, Section 13.7.

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 097823 – PHENOLIC INTERIOR WALL PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Phenolic interior wall paneling.
2. Accessories.

1.3 RELATED SECTIONS

A. Section 061053 “Miscellaneous Rough Carpentry” for wood furring, blocking, and shims.

1.4 REFERENCES

A. American Society for Testing and Materials
1. E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
2. E2768 – Standard Test Method for Extended Duration Surface Burning Characteristics of Building Materials.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on physical characteristics, durability, installation instructions, and fire-test-response characteristics.

B. Shop Drawings: Include size, panel layout trim, accessories, supports and attachments.

C. Samples for Initial Selection: For each type of phenolic wall panel.

D. Samples for Verification: For each type of wall panel submit manufacturer's finished samples 12-inch x 12-inch in specified color.

E. Warranty:
   1. Manufacturers warranty certificate.
   2. Installers written warranty statement.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each wall panel, for tests performed by a qualified testing agency.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wall panels to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for installation.

   1. Build mockups for each type of wall panel on each substrate required. Comply with requirements in ASTM F1141 for appearance shading characteristics.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
   4. Construct mockup at full size 8-foot x 8-foot erected at site.

B. Single Source Responsibility: Source from a single manufacturer for all components.

C. Manufacturers Qualifications:
   1. Successfully completed projects of similar scale using phenolic materials.

D. Installer Qualifications:
   1. Successfully completed projects of similar scale using phenolic materials.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install wall panels until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.

   1. Wood-Veneer Wall Coverings: Condition spaces for not less than 48 hours before installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical wall panels applied with identical adhesives to substrates in accordance with test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.
c. Flame Spread/Smoke Developed Index: Class B.

2.2 PHENOLIC INTERIOR WALL CLADDING

A. Basis-of-Design Products: Subject to compliance with requirements, provide Fiberesin Industries, Inc., Stonewood Panels; or comparable product by one of the following:

1. American Architectural Millwork.
2. ASI Architectural.
3. Hunter Douglas Architectural.
4. Or Approved Equal.

B. Description: Solid phenolic laminate panel with clear abrasion resistant overlay.

1. Style: As selected by Architect from the manufacturer's full range.
2. Color: As selected by Architect from the manufacturer's full range..
3. Finish: Factory #60 matte.
4. Panel Sizes: As indicated on drawings.
5. Thickness: ½ inch.
6. Panel Core: Phenolic resin treated layer, black and brown natural kraft paper.
7. Decorative Layer: Melamine resin, pigment, and treated process.
8. Abrasions Resistance: Applied to protect decorative wood grain panels from abrasion.
9. ASTM E84 Flame and Smoke Development: Class B.

C. Physical Properties:
1. Chemical Resistance Testing
a. SEFA 8-PH, Section 8:1: Pass Testing/SEFA 8 compliant.
2. Heavy-metals free.
3. Halogenated-fire-retardant free.
4. Microvented.

2.3 FABRICATION

A. Fabrication Tolerances:

1. NEMA Testing Results
   a. Dimensional Change, 3.11 test
      1) Length (Machine Direction): 0.25 percent.
      2) Width (Cross Direction): 0.50 percent.

2.4 ACCESSORIES

A. Fasteners: Manufacturer approved stainless steel fastener with bi-metal welded carbon steel point.
   1. Concealed fasteners.

B. Attachment System: Manufacturers approved sub-frame system to support cladding weights of up to 8 pounds per square foot, fabricated of 0.09 -inch 6063 T5 extruded aluminum or 16-gage G90 galvanized steel.

C. Corner Profile: Extrusion at corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation surfaces being true in plane and vertical and horizontal alignment, maximum moisture content, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Allow panels to acclimate to interior conditions for a minimum of 24 hours.

3.2 INSTALLATION OF WALL PANELS

A. Install in accordance with manufacturer's written instructions and Shop Drawings, maintaining ventilation spacing requirements.

B. Fasten panels to an approved attachment system structurally supported by aluminum, galvanized steel, or wood stud supported wall.

C. Install panel square, edges clean and true to size.
   1. Cut panels to fit at perimeter and around penetrations with minimum ¼-inch gap.

D. Do not install damaged, irregular or defective panels.

3.3 FIELD QUALITY CONTROL

A. Inspect panel ventilation at top and bottom of wall, and manufacturer's installation instructions have been followed.

B. Verify installation, fasteners and connections with adjacent materials, and transitions have been completed in accordance with shop drawings.

3.4 ADJUSTING

A. Modify, adjust and replace panels not within manufacturer's tolerances and as required by Architect.

3.5 PROTECTION

A. Protect surface, corners and components from damage prior to Owner occupancy.

END OF SECTION 097823

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Primers.
2. Water-based finish coatings.

B. Related Requirements:
1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
2. Section 055213 "Pipe and Tube Railings" for shop priming and painting pipe and tube railings.
3. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product Schedule: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.2 PAINT PRODUCTS, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 PRIMERS

A. Interior, Institutional Low-Odor/VOC Primer Sealer: Water-based primer sealer with low-odor characteristics and a VOC of less than 10 grams per liter for use on new interior plaster, concrete, and gypsum wallboard surfaces that are subsequently to be painted with latex finish coats.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); ProGreen 200 Zero VOC or a comparable product by one of the following:

    a. Benjamin Moore & Co.
    b. McCormick Paints.
    c. PPG Paints; PPG Industries, Inc.
    d. Or Approved Equal.

B. Water-Based Rust-Inhibitive Primer: Corrosion-resistant, water-based-emulsion primer formulated for resistance to flash rusting when applied to cleaned, interior ferrous metals subject to mildly corrosive environments.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); All Surface Enamel Latex Primer, or a comparable product by one of the following:

    a. Benjamin Moore & Co.
    b. PPG Paints; PPG Industries, Inc.
    c. Rust-Oleum Corporation; a subsidiary of RPM International, Inc.
    d. Or Approved Equal.

2.4 WATER-BASED FINISH COATS

A. Interior, Latex, Institutional Low Odor/VOC, Eggshell: White or colored latex paint with low-odor characteristics and a VOC of less than 10 grams per liter, for use in areas, such as hospitals and other occupied buildings, where the odor and VOC levels of conventional latex products would preclude their use.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); ProMar 200 Zero VOC, or a comparable product by one of the following:

    a. Benjamin Moore & Co.
    b. Kelly-Moore Paints.
    c. PPG Paints; PPG Industries, Inc.
    d. Or Approved Equal.

2. Gloss and Sheen Level: Manufacturer's standard eggshell finish.

B. Interior, Water-Based Light-Industrial Coating, Semigloss: Pigmented, water-based emulsion coating for interior primed wood and metal surfaces (e.g., walls, doors, frames, trim, and sash), providing resistance to moderate abrasion and mild chemical exposure and corrosive conditions.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); Pro Industrial Acrylic Coating, or a comparable product by one of the following:

    a. Benjamin Moore & Co.
    b. McCormick Paints.
    c. PPG Paints; PPG Industries, Inc.
    d. Or Approved Equal.

2. Gloss Level: Manufacturer's standard semigloss finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Gypsum Board: 12 percent.
6. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Aluminum Substrates: Remove loose surface oxidation.

H. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 INSTALLATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.
4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Interior, institutional low-odor/VOC primer sealer.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior latex, institutional low odor/VOC, low sheen .

B. Steel Substrates:

1. Latex over Shop-Applied Quick-Drying Shop Primer System:

a. Prime Coat: Quick-dry primer for shop application.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior, latex, eggshell.

2. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Water-based rust-inhibitive primer.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior, latex, institutional low odor/VOC, eggshell.

C. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Water-Based Light-Industrial Coating System:

a. Prime Coat: Quick-dry primer for aluminum.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior, water-based, light-industrial coating, eggshell gloss.

D. Finish Carpentry: Wood trim Doors Windows.

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Interior latex primer for wood.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior, latex, institutional low odor/VOC, semigloss.

E. Gypsum Board and Plaster Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Interior, institutional low-odor/VOC primer sealer.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Interior, latex, institutional low odor/VOC, eggshell.

END OF SECTION 099123

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 099300 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Transparent finishes.

B. Related Requirements:

   1. Section 099123 "Interior Painting" for stains and transparent finishes on concrete floors.

1.3 ACTION SUBMITTALS

A. Product Data:

   1. For each type of product.
   2. Include preparation requirements and application instructions.
   3. Indicate VOC content.

B. Samples for Verification: Sample for each type of finish system and in each color and gloss of finish required on representative samples of actual wood substrates.

   1. Size: 8 inches square or 8 inches long.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

C. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Stains and Transparent Finishes: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 MOCKUPS

A. Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under Sample submittals and to set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of stain color selections will be based on mockups.

a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures of less than 5 deg F above the dew point, or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations: Obtain each coating product from single source from single manufacturer.

2.2 MATERIALS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

B. Stain Colors: As selected by Architect from manufacturer's full range.

2.3 TRANSPARENT FINISHES

A. Varnish, Interior, Water Based, Clear, Semigloss: Water-based clear semigloss coating for interior wood trim, frames, doors, paneling and cabinetry.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); Minwax 63020 or comparable product by one of the following:
   a. Benjamin Moore & Co.
   b. PPG Paints; PPG Industries, Inc.
   c. Or Approved Equal.
2. Gloss Level: Manufacturer's standard semigloss finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.

C. Maximum Moisture Content of Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with finish application only after unsatisfactory conditions have been corrected.

1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

B. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.

1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.

C. Interior Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Apply wood filler paste to open-grain woods to produce smooth, glasslike finish.
3. Sand surfaces exposed to view and dust off.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions.

1. Use applicators and techniques suited for finish and substrate indicated.
2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood Substrates, Architectural Woodwork Doors:

1. Water-Based Varnish System:

    a. Prime Coat: Water-based varnish matching topcoat.
    b. Intermediate Coat: Water-based varnish matching topcoat.
    c. Topcoat: Varnish, water based, clear, semigloss.

B. Wood Substrates, Casework:

1. Water-Based Varnish System:

    a. Prime Coat: Water-based varnish matching topcoat.
    b. Intermediate Coat: Water-based varnish matching topcoat.
    c. Topcoat: Varnish, water based, clear, semigloss.

END OF SECTION 099300

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 102113.19 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.

B. Related Requirements:
1. Section 061053 "Miscellaneous Rough Carpentry" for blocking.
2. Section 092216 "Non-Structural Metal Framing" for blocking.
3. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.3 COORDINATION

A. Coordinate requirements for overhead supports, blocking, reinforcing, and other supports concealed within wall.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Solid-plastic toilet compartments:

a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For solid-plastic toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show ceiling grid, ceiling-mounted items, and overhead support or bracing locations.
6. .

C. Samples for Verification: Actual sample of finished products for each type of toilet compartment indicated.

1. Size: 6-inch-square, of same thickness indicated for Work.
2. Include each type of hardware and accessory.

D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.5 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Product Certificates: For each type of toilet compartment by manufacturer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: One hinge(s) with associated fasteners.
2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: One bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.
5. Fasteners: 10 fasteners of each size and type.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.

B. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with ASTM E84:
1. Class B flame spread/smoke developed rating.

C. Material Fire Ratings:
   1. National Fire Protection Association (NFPA) 286: Pass.
   2. International Code Council (ICC): Class B.

D. Regulatory Requirements: Comply with applicable provisions in the U.S. Department of Justice "2010 ADA Standards for Accessible Design" and ICC A117.1 for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Scranton Products, Hiny Hiders, or a comparable product by one of the following:

   1. AJW Architectural Products.
   2. ASI Global Partitions.
   3. Partition Systems International of South Carolina (PSIC); Columbia Systems International of South Carolina LLC.
   4. Or Approved Equal.

B. Toilet-Enclosure Style: Overhead braced Floor anchored.

C. Entrance-Screen Style: Overhead braced Floor anchored.

D. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

   1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
   2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
   3. Color and Pattern: in each room as selected by Architect from manufacturer's full range.

E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.

F. Brackets (Fittings):

   1. Stirrup Type: Ear or U-brackets, stainless steel.
   2. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories, Heavy Duty: Manufacturer's heavy-duty operating hardware and accessories.

   1. Hinges: Manufacturer's minimum 0.062-inch-thick stainless steel paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door. Mount with through bolts.

2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast-stainless steel latch unit, designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through bolts.
3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless steel hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories. Mount with through bolts.
4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast-stainless steel bumper at outswinging doors. Mount with through bolts.
5. Door Pull: Manufacturer's heavy-duty, cast-stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface.

B. Aluminum Castings: ASTM B26/B26M.

C. Aluminum Extrusions: ASTM B221.

D. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

E. Stainless Steel Castings: ASTM A743/A743M.

F. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, inswinging doors for standard toilet compartments and 36-inch-wide, outswinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF PLASTIC TOILET COMPARTMENTS

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.
b. Panels and Walls: 1 inch.

2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.

a. Locate wall brackets, so holes for wall anchors occur in masonry or tile joints.
b. Align brackets at pilasters with brackets at walls.

3. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

a. Locate bracket fasteners, so holes for wall anchors occur in masonry or tile joints.
b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust, so tops of doors are parallel with overhead brace when doors are in closed position.

C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust, so tops of doors are level with tops of pilasters when doors are in closed position.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 102113.19

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Hand dryers.
3. Underlavatory guards.
4. Custodial accessories.

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Samples: For each exposed product and for each finish specified, full size.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.

D. Delegated Design Submittal: For grab bars.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Toilet-Compartment Occupancy-Indicator Systems: Manufacturer agrees to repair or replace toilet-compartment occupancy-indicator systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Toilet Tissue (Roll) Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bobrick Washroom Equipment, Inc.
    b. Bradley Corporation.
    c. ASI-American Specialties, Inc.
    d. Or Approved Equal.

2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
3. Mounting: Surface mounted.
4. Operation: Noncontrol delivery with theft-resistant spindle.
5. Capacity: Designed for 5-inch- diameter tissue rolls.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Combination Towel (Folded) Dispenser/Waste Receptacle:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bobrick Washroom Equipment, Inc.
    b. Bradley Corporation.
    c. ASI-American Specialties, Inc.
    d. Or Approved Equal.

2. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
3. Mounting: Recessed with projecting receptacle.

    a. Designed for nominal 4-inch wall depth.

4. Minimum Towel-Dispenser Capacity: 600 C-fold or 800 multifold paper towels.
5. Minimum Waste-Receptacle Capacity: 12 gal..
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
7. Liner: Reusable, vinyl waste-receptacle liner.
8. Lockset: Tumbler type for towel-dispenser compartment and waste receptacle.

D. Automatic Soap Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bradley Corporation.
    b. AJW Architectural Products.
    c. ASI-American Specialties, Inc.

d. Or Approved Equal.

2. Description: Automatic dispenser with infrared sensor to detect presence of hands; battery powered; designed for dispensing soap in liquid or lotion form.
3. Mounting: Surface mounted.
4. Capacity: 30-fl. oz.
5. Materials: Type-304, 18-gauge stainless steel with satin-finish.
6. Refill Indicator: LED indicator.
7. Low-Battery Indicator: LED indicator.

E. Grab Bar:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Bobrick Washroom Equipment, Inc.
   b. Bradley Corporation.
   c. ASI-American Specialties, Inc.
   d. Or Approved Equal.

2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

   a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length: As indicated on Drawings.

F. Sanitary-Napkin and Tampon Vendor:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Bobrick Washroom Equipment, Inc.
   b. Bradley Corporation.
   c. ASI-American Specialties, Inc.
   d. Or Approved Equal.

2. Mounting: Surface mounted.
3. Capacity: 20 sanitary-napkins and 30 tampons
4. Operation: No coin (free).
5. Exposed Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
6. Lockset: Tumbler type with separate lock and key for coin box.

G. Sanitary-Napkin Disposal Unit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Bobrick Washroom Equipment, Inc.

b. Bradley Corporation.
c. ASI-American Specialties, Inc.
d. Or Approved Equal.

2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

H. Seat-Cover Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bobrick Washroom Equipment, Inc.
b. Bradley Corporation.
c. ASI-American Specialties, Inc.
d. Or Approved Equal.

2. Mounting: Surface mounted.
3. Minimum Capacity: 250 seat covers.
4. Exposed Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Lockset: Tumbler type.

I. Mirror Unit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bobrick Washroom Equipment, Inc.
b. Bradley Corporation.
c. ASI-American Specialties, Inc.
d. Or Approved Equal.

2. Frame: Stainless steel, fixed tilt.

a. Corners: Manufacturer's standard.

3. Size: As indicated on Drawings.

4. Hangers: Manufacturer's standard rigid, tamper and theft resistant.

2.3 HAND DRYERS

A. Source Limitations: Obtain hand dryers from single source from single manufacturer.

B. High-Speed Air Dryer:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bobrick Washroom Equipment, Inc.
    b. Bradley Corporation.
    c. ASI-American Specialties, Inc.
    d. Or Approved Equal.

2. Description: High-speed, warm-air hand dryer for rapid hand drying.
3. Mounting: Surface mounted.

    a. Protrusion Limit: Installed unit protrudes maximum 4 inches from wall surface.

4. Operation: Infrared-sensor activated with timed power cut-off switch.

    a. Average Dry Time: 12 seconds.
    b. Automatic Shut Off: At 85 seconds.

5. Maximum Sound Level: 75 dB.
6. Cover Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
7. Electrical Requirements: 115 V, 13 A, 1500 W.

2.4 UNDERLAVATORY GUARDS

A. Underlavatory Guard:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Buckaroos, Inc.
    b. Plumberex Specialty Products, Inc.
    c. Truebro; IPS Corporation.
    d. Or Approved Equal.

2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.5 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Custodial Mop and Broom Holder:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Bobrick Washroom Equipment, Inc.

b. Bradley Corporation.
c. ASI-American Specialties, Inc.
d. Or Approved Equal.

2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches.
4. Hooks: Four.
5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.
b. Rod: Approximately 1/4-inch-diameter stainless steel.

C. Custodial Paper Towel (Roll) Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bobrick Washroom Equipment, Inc.
b. Bradley Corporation.
c. ASI-American Specialties, Inc.
d. Or Approved Equal.

2. Description: Lever-actuated mechanism permitting controlled delivery of paper rolls in preset lengths.
3. Mounting: Surface mounted.
4. Minimum Capacity: 8-inch-wide, 800-foot-long roll.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
6. Lockset: Tumbler type.

D. Custodial Soap Dispenser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bobrick Washroom Equipment, Inc.
b. Bradley Corporation.
c. ASI-American Specialties, Inc.
d. Or Approved Equal.

2. Description: Designed for manual operation and dispensing soap in liquid or lotion form.
3. Mounting: Horizontally oriented, surface mounted.
4. Capacity: 40-fl oz..
5. Materials: Type-304, 22-gauge stainless steel with satin-finish.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

2.6 MATERIALS

A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch-minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B19, flat products; ASTM B16/B16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

C. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch-minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.

G. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.7 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Remove temporary labels and protective coatings.

B. Grab Bars: Install to comply with specified structural-performance requirements.

C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 102800

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguisher.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
2. Show location of knockouts for hose valves.

B. Shop Drawings: For fire-protection cabinets.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For each type of exposed finish required.

D. Samples for Verification: For each type of exposed finish required, prepared on samples 6 by 6 inches square.

E. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Babcock-Davis.
   b. Larsen’s Manufacturing Company.
   c. Nystrom, Inc.
   d. Or Approved Equal.

B. Cabinet Construction: One-hour fire rated Two-hour fire rated.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel sheet .

1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet:

1. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box, to act as drywall bead.
2. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
3. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Steel sheet.

G. Door Style: Fully glazed panel with frame.

H. Door Glazing: Clear float glass.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting lever handle with cam-action latch .
2. Provide continuous hinge, of same material and finish as trim, , permitting door to open 180 degrees.

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
3. Break-Glass Door Handle: Manufacturer's standard, integral to glass with the words "PULL TO BREAK GLASS" applied to handle.
4. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
5. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
6. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

    a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

        1) Location: Applied to cabinet door .
        2) Application Process: Decals.
        3) Lettering Color: White.
        4) Orientation: Horizontal.

7. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by batteries.

K. Materials:

1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.

a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
c. Color: As selected by Architect from manufacturer's full range.

2. Clear Float Glass: ASTM C1036, Type I, Class 1, Quality q3, 3 mm thick.

2.4 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Miter corners and grind smooth.
3. Provide factory-drilled mounting holes.
4. Prepare doors and frames to receive locks.
5. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for hose and cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at height indicated below:

1. Fire-Protection Cabinet Mounting Height: 42 inches above finished floor to top of fire extinguisher.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification:
1. Apply decals on field-painted fire-protection cabinets after painting is complete.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

B. Related Requirements:

1. Section 104413 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Guardian Fire Equipment, Inc.
b. Kidde; Carrier Global Corporation.
c. Larsen’s Manufacturing Company.
d. Or Approved Equal.

2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
3. Valves: Manufacturer's standard.
4. Handles and Levers: Manufacturer's standard.
5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type: UL-rated 2-A:10-B:C,5-lb nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 104416

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Motor-operated roller shades with double rollers.

B. Related Requirements:

   1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
   2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

   1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For each type and color of shadeband material.

   1. Include Samples of accessories involving color selection.

D. Samples for Verification: For each type of roller shade.

   1. Shadeband Material: Not less than 10 inches square. Mark interior face of material if applicable.
   2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
   3. Installation Accessories: Full-size unit, not less than 10 inches long.

E. Product Schedule: For roller shades.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MOTOR-OPERATED, DOUBLE-ROLLER SHADES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Draper, Inc; Dual Roller Motorized Flexshade, or comparable product by one of the following:
   1. Lutron Electronics Co., LLC.
   2. MechoShade Systems, LLC.
   3. Hunter Douglas, Inc.
   4. Or Approved Equal.

B. Motorized Operating Systems: Provide factory-assembled, shade-operator systems of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

   1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Electric Motor: Manufacturer's standard tubular, enclosed in rollers.

      a. Electrical Characteristics: 120-V ac.
      b. Maximum Total Shade Width: As required to operate roller shades indicated.
      c. Maximum Shade Drop: As required to operate roller shades indicated.
      d. Maximum Weight Capacity: As required to operate roller shades indicated.

   3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
      a. Individual Switch Control Station: Maintained-contact, wall-switch-operated control station with open, close, and center off functions.

         1) Switch Positions: Three.
         2) Switch Style: Toggle.

b. Group Control Station: Maintained-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for single-switch group control.
c. Individual/Group Control Station: Maintained-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
d. Color: As selected by Architect from manufacturer's full range.

4. Crank-Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
5. Limit Switches: Adjustable switches, interlocked with motor controls and set to stop shade movement automatically at fully raised and fully lowered positions.
6. Operating Features:

a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
b. Override switch.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shades for service.

1. Double-Roller Mounting Configuration: Offset, outside shade over and inside shade under.
2. Inside Roller:

a. Drive-End Location: Right side of interior face of shade.
b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

3. Outside Roller:

a. Drive-End Location: Right side of interior face of shade.
b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

4. Shadeband-to-Roller Attachment: Manufacturer's standard method.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

E. Inside Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.
b. Color and Finish: As selected by Architect from manufacturer's full range.

F. Outside Shadebands:

1. Shadeband Material: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

    a. Type: Enclosed in sealed pocket of shadeband material.
    b. Color and Finish: As selected by Architect from manufacturer's full range.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

    a. Shape: L-shaped.
    b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches.

2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

    a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than as indicated on Drawings.

3. Endcap Covers: To cover exposed endcaps.

4. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recesses or pockets and for snap-in attachment to wall clip without fasteners.

    a. Closure-Panel Width: 2 inches.

5. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
6. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
7. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.
2. Type: Woven PVC-coated fiberglass and PVC-coated polyester.
3. Weave: Basketweave.
4. Thickness: Manufacturer’s standard.
5. Weight: Manufacturer’s standard.
6. Roll Width: 60 inches.
7. Orientation on Shadeband: Up the bolt.

8. Openness Factor: 2 percent.
9. Color: As selected by Architect from manufacturer's full range.

C. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.
2. Type: Fiberglass textile with PVC film bonded to both sides.
3. Thickness: Manufacturer’s standard.
4. Weight: Manufacturer’s standard.
5. Roll Width: 60 inches.
6. Orientation on Shadeband: Up the bolt.
7. Features: Washable.
8. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Skylight Shades: Provide battens and seams at uniform spacings along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.
3. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

C. Roller Shade Locations: As indicated on Drawings.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Part. Rel. Interior Bldg.
building review
Raffaele Persico
Released: 11/09/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.

B. Related Requirements:

1. Section 224218 " Plumbing Fixtures" for sinks and plumbing fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.
2. Wood trim, 8 inches long.
3. One full-size solid surface material countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Meganite Inc.
b. Wilsonart LLC.
c. Formica Corporation.
d. Or Approved Equal.

2. Type: Provide Standard type unless Special Purpose type is indicated.
3. Colors and Patterns: As selected by Architect from manufacturer's full range.

B. Performance Characteristics:
   1. Flame spread/smoke developed index: Class 1A, tested on ASTM E84.
   2. Stain Resistance: No effect, tested to ANSI Z-124.3.
   3. Wear and cleanability: Pass ANSI Z-124.3.
   4. Fungus resistance: Does not support microbial growth, tested to ASTM G21.
   5. Bacteria resistance: Does not support microbial growth, tested to ASTM G22.
   6. Meet ANSI/NSF 51.
   7. Impact resistance: Pass 1/2 pound ball drop, tested to ANSI/NEMA LD 3-3.3.
   8. Color stability: No change, tested to ANSI/NEMA LD 3-3.3.
   9. Boiling water surface resistance: No effect, tested to ANSI/NEMA LD 3-3.5.
   10. High temperature resistance: No effect, tested to ANSI/NEMA LD 3-3.5.
   11. Water absorption: 0.04 percent, tested to ASTM D570.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

   1. Grade: Custom.

B. Configuration:

   1. Front: Straight, slightly eased at top.
   2. Backsplash: Straight, slightly eased at corner.
   3. End Splash: Matching backsplash.

C. Countertops: 1/2-inch- thick, solid surface material with front edge built up with same material.

D. Backsplashes: 1/2-inch- thick, solid surface material.

E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

F. Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated.

   1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.

G. Cutouts and Holes:

   1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

      a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.

   2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.

2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

I. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

Department of Community Affairs
Construction Project Review
Project No: 9184-23
Limited Partial Release
Elevator
Daniel Tober
Released: 11/13/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 14 21 23 - GEARED TRACTION ELEVATOR MODERNIZATION

PAR 1 GENERAL

1.01 DESCRIPTION

A. Work included: Provide materials, labor, and services necessary to complete the required modernization and testing of two (2) overhead geared traction passenger elevators as specified herein.

B. Related Contract Work Performed by Others:
1. Storage space for tools and materials.
2. New disconnects or circuits breakers and wire to the elevator control panels. Locate in accordance with code requirements.
3. Electric power for testing, adjusting and operation of equipment.
4. Lighting of pits, hoistways control room and machine room as appropriate.
5. Bevel any cants or setbacks required on side or rear walls and beams that project four (4) or more inches.
6. Telephone wiring to control panels.
7. Smoke and heat detectors if required.
8. Signals from fire alarm system.
9. Wiring from emergency power source and/or appropriate transfer switches and signals.
10. Hoistway ventilation as per Code requirements.

C. Related Work Performed by Elevator Contractor:
1. Cutting and patching of existing walls to facilitate the installation of signal and operating devices as applicable.
2. Extend the existing pit ladders to forty-eight (48) inches above finish floor in order to access elevator pit.
3. Fire safe all penetrations in the elevator hoistways, control and machine rooms that currently exist and those that may be created during the course of the contract work.
4. Elevator control and machine rooms walls, and floors are to be painted upon completion of the contract work.
5. Provide and maintain approved portable accordion barricades as required for the work being performed. Provide signage as directed to patrons while work is commencing throughout the project. Submit design for approval.
6. Secure all required variances from the State of New Jersey-DCA.

1.02 REFERENCES

A. Applicable Codes :
1. American National Standard, Safety Code for Elevators and Escalators (ASME A17.1-2019).
2. Safety Code for Existing Elevators and Escalators (ASME A17.3).
3. ASME A17.5/CSA-B44.1 - Elevator and escalator electrical equipment.
4. Building Officials and Code Administrators International, Inc., Basic Building Code (BOCA).

5. American Disabilities Act - ADAAG published in Federal Register July 26, 1991.
6. American National Standard Specification for Making Buildings and Facilities.
7. Accessibility to and Usable by Physically Handicapped People (ANSI A117.1).
8. National Electric Code-NEC, current code.
9. State of New Jersey Barrier Free requirements.
10. In case of conflict between codes, regulations or standards, the most stringent requirement shall take precedence.

1.03 DEFINITIONS

A. The following definitions apply to work of this Section:
1. "Provide": to furnish and install, complete for safe operation, unless specifically indicated otherwise.
2. "Install": to erect, mount and connect complete with related accessories.
3. "Supply": to purchase, procure, acquire, and deliver complete with related accessories.
4. "Work": labor and materials required for proper and complete installation.
5. "Wiring": raceway, fittings, wire, boxes, and related items.
6. "Concealed": embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.
7. "Exposed": not installed underground or "concealed" as defined above.
8. "Indicated", "shown", or "noted": as indicated, shown, or noted on Drawings or as specified.
9. "Similar" or "equal": of base bid manufacturer, equal in materials, weight, size, design, and efficiency of specified product, conforming with "Acceptable manufacturers."
10. "Reviewed", "satisfactory", "accepted", or "directed": as reviewed, satisfactory, accepted or directed, by or to Owner.

1.04 SUBMITTALS

A. Shop Drawings and Samples: Provide complete signed and sealed shop drawings, to scale. Include layouts of pits, control and machine rooms, power and heat data and required clearances.
1. Provide shop drawings of new signal and operating fixtures.
2. Provide shop drawings for car & hoistway doors and operating equipment.
3. Copies of permits
4. Materials and finishes exposed to public view, 6" by 6" panels or 12" lengths as applicable.
5. Specifications indicate the general arrangement of the elevator work. Elevator Contractor shall carefully review this documentation along with field conditions and to be responsible for the proper fitting of the equipment and material indicated.

B. Owner/Service Manuals: Prior to installation, Contractor shall submit two (2) sets of operation and maintenance manuals for approval. After Owner approval and

prior to the beginning of acceptance testing, four (4) sets of the approved manuals shall be provided by the Contractor. The manuals shall include the following:

1. Equipment and components, descriptive literature.
2. Performance data, model number.
3. Installation instructions.
4. Operating instructions.
5. Maintenance and repair instructions.
6. Troubleshooting techniques.
7. Spare parts lists and current price lists.
8. Lubrication instructions.
9. Detailed, record and as-built layout drawings.
10. Detailed, simplified, as built, one line, wiring diagrams. Provide one (1) complete set per manual.
11. Field test reports.
12. Complete set of contract software.
13. Six (6) keys for each new key-operated device that is provided.
14. Diagnostic tools configured to perform at all levels.
15. The contractor will provide certification, in writing and signed by an officer of the organization, that the owner of the elevators shall be provided with copies of any and all information, correspondence, bulletins, newsletters, manuals, techniques, procedures, drawings, sketches and any other documents related to maintenance, safety, operations, design changes, modifications, retrofits, etc., which relate to any part, component, equipment, system, subsystem or material and services applicable to the elevators provided.
16. All of the above referenced shall be provided as it pertains to the original installation and for a period of ten (10) years after final acceptance of the last elevator provided.
17. The reference material shall be provided within thirty (30) days of publication or internal distribution by the elevator manufacturer. The material, even if labeled PROPRIETARY, shall be delivered to the Owner without prejudice or delay and at no additional cost.

C. Control and Machine Room Prints: Provide complete sets of "as-built" field wiring and straight- line wiring diagrams showing all electrical circuits in the hoistway as well as the control and machine rooms. These diagrams shall be laminated and provided in the elevator control room as directed.

1.05 QUALITY ASSURANCE

A. Quality and gauges of materials:
   1. New, best of their respective kinds, free from defects.
   2. Materials, equipment of similar application; same manufacturer, except as noted.
   3. Gauges as noted.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Ship in original crated sections of a size to permit passage through available space.

B. Obtain approval and schedule delivery of material to meet Owner's requirements.

C. Storage of equipment and materials shall be coordinated with Owner.

D. Removal of Rubbish and Existing Equipment
1. On a scheduled basis the Contractor shall remove from the job site all rubbish generated in performing work specified in the contract documents.
2. Any component of the existing elevator equipment that is not reused under the scope of work shall become the property of the Contractor and as such shall be removed from the premises at the Contractor’s sole expense.

1.07 WARRANTY

A. The elevators and associated equipment shall be free of defective material, imperfect work, and faulty operation not due to ordinary wear and tear or improper use or care, for a period of one (1) year from final acceptance of each elevator. Defective work shall be repaired or replaced at no additional cost to the Owner.

1.08 MAINTENANCE SERVICE

A. Initial Full Maintenance Service: Provide interim maintenance of completed elevator work and initial twelve (12) month maintenance service during warranty period, by fully trained elevator mechanics. The initial maintenance shall commence upon completion and acceptance of all elevator work. Preventive maintenance examinations are to occur every other week totaling a monthly minimum of six (6) mechanic hours (exclusive of repairs and callbacks) for adjustment, greasing, oiling, and parts replacement due to normal elevator usage. Callbacks, repairs, and testing efforts is not to be calculated in this time requirement. Provide unlimited regular time and twenty-four (24) hour emergency call back service, including travel time, at no additional cost.

B. All maintenance activities performed in accordance with the procedures set forth in the approved maintenance manual. Each month, the contractor is to submit a written detailed breakdown of all activities occurring in the previous month. In addition, the reports are to be provided in an electronic format acceptable to the owner’s needs.

C. Extended Preventive Maintenance Service: Contractor is to submit a separate firm cost for extending the preventive maintenance service for a period of four (4) years commencing on the expiration of the initial twelve (12) month coverage.

D. Preventive Maintenance Service
1. Full-Service Coverage

a. Every other week, adjust, lubricate, clean and when conditions warrant, repair, or replace the following items and all other mechanical or electrical equipment:
   1) Geared Machine: Worm, gear, thrust bearings, lateral bearings, shaft bearings, drive sheave, and other machine components.
   2) Brake pulley, brake coil, brake pins, brake contacts, linings, and other brake components.
   3) Motor windings, rotating elements, commutators, brushes, brush holders, bearings, and field coils.
   4) Controller equipment: All components including all relays, solid state components, resistors, condensers, a/c units, transformers, contacts, leads, computer devices, selector switches, mechanical or electrical driving equipment, coils, magnet frames, contact switch assemblies, springs, solenoids, resistance grids, hoistway vanes, magnets, and inductors.
   5) Governor: Including governor sheave, shaft assembly gears, bearing contacts, jaws, and pit tension assembly.
   6) Sheaves: Including deflector, shafts, bearings, grease retainers, contacts and hold down devices.
   7) Hoistway door interlocks or locks and contacts, hoistway door hangers, tracks, bottom door gibs, cams, rollers and auxiliary door closing devices for power operated doors.
   8) Hoistway limit switches, slowdown switches, leveling switches and associated cams, vanes, and electronic components.
   9) Guide shoes assemblies including rollers.
   10) Automatic power operated door operators, door protective devices, car door hangers, tracks, and car door contacts.
   11) Traveling cables.
   12) Elevator control wiring in hoistway and machine room.
   13) Hoist cables, governor cables, including adjustment of tension on all cables.
   14) Car safety mechanism and load weighing equipment.
   15) Buffers.
   16) Fixture contacts, pushbuttons, key switches, locks, lamps and sockets or button stations (car and hall), car lanterns, position indicators (car and hall), direction indicators.
   17) The guide rails shall be kept free of rust and dry.
   18) In each car, the ADA/handicapped telephone.
   19) Examine all safety devices, governors and conduct an annual no-load test and every fifth year perform a full load, full speed test of safety mechanism, overhead speed governors, car, and counterweight buffers. The car balance shall be checked, and governor set. If required, the governor shall be calibrated and sealed for proper tripping speed. All tests shall be performed in accordance with the provisions of the American National Standard, Safety Code for Elevators and Escalators (ANSI/ASME A17.2), current edition.
b. All replacement parts shall be new and specifically designed for the elevators on which they are to be used. All old parts must be returned to

the Owner upon completion of repairs if requested by the Building Manager.

c. The Contractor shall furnish and use lubricants as recommended by the original manufacturer of the equipment or an approved equal.
d. The Contractor shall be responsible for keeping the exterior of the elevator machinery and any other parts of the equipment, painted with heat resistant enamel and presentable at all times. The motor windings shall be treated as needed, with proper insulating compound as recommended by the motor manufacturer.
f. The Contractor shall maintain all elevator equipment within enclosures, pits, machine rooms and the assigned Contractor workspace is to be kept clean and orderly, free of dirt, dust and debris, pits and machine spaces shall be kept dry and clean. Contractor shall be responsible for disposal of all waste in accordance with local, state, and federal requirements.
g. The Contractor shall not be required to install new attachments on the elevator whether recommended or directed by insurance companies or by governmental authorities, nor make any replacements with parts of a different design. The Contractor shall not be required to make renewals or repairs necessitated by reason of negligence or misuse of the equipment or by reason of any other cause beyond the Contractor's control except ordinary wear and tear unless the Contractor receives just compensation.
h. The Contractor shall not be responsible for the following items of elevator equipment: car enclosure (including removable panels, door panels, car gates, hung ceilings, light diffusers, handrails, mirrors, and carpets), hoistway enclosure, hoistway doors, frames, and sills.
i. All work is to be performed during regular working hours of regular working days, except for emergency callback service. Emergency calls shall be answered at all hours of the day or night and responded to within one (1) hour during normal working hours and within two (2) hours at all other times without any additional cost to the owner.
k. The Contractor shall supply and install all control system software upgrades at no additional charge, for the term of the maintenance agreement.
l. Owner may terminate this maintenance coverage for its convenience, in whole or in part, by thirty (30) days written notice to the contractor specifying the extent to which performance of services is terminated and the date upon which such termination becomes effective.

E. Maintenance Responsibility

1. The Contractor shall keep the elevator maintained to operate at the original contract speed, keeping the original performance times, including acceleration and retardation as designed and installed by the manufacturer. The door operation shall be adjusted as required to maintain the original door opening and door closing times, within legal limits
2. The Owner reserves the right to make inspections and tests as and when deemed advisable. If it is found that the elevator and associated equipment are deficient either electrically or mechanically, the Contractor will be notified of these deficiencies in writing, and it shall be his responsibility to make corrections within thirty (30) days after his receipt of such notice. If the

deficiencies have not been corrected within thirty (30) days, the Owner may terminate the contract and employ a Contractor to make the corrections at the original bidder's expense.

F. Approximately six (6) months prior to the end of the warranty maintenance period, the Owner will make a thorough inspection of the elevator. Contractor is responsible to provide assistance with field personnel responsible for normal maintenance procedures. At the conclusion of this inspection, the Owner shall give the Contractor written notice of any deficiencies found. The Contractor shall be responsible for correction of these deficiencies within thirty (30) days after receipt of such notice.

G. Diagnostic Tools and Spare Parts: At the completion of the work as specified, the Contractor shall provide items listed. These items shall become the Owner's property.
1. One (1) complete set of all diagnostic tools and equipment required for the complete maintenance of all aspects of the control and dispatch system and solid-state motor drive units. The diagnostic system shall be an integral part of the controller and provide user-friendly interaction between the serviceman and the controls. All such systems shall be free from secret codes and decaying circuits that must be periodically reprogrammed by the manufacturer. Diagnostic equipment shall be permanently mounted in the control cabinet or secured in a lock cabinet within the elevator machine room.

1.09 ELECTRIC SERVICE

A. Power: 208 volts, 3 phase, 60 hertz.

B. Lighting: 110 volts, 1 phase, 60 hertz.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Product of individuals, firms or corporations regularly engaged in modernizing elevators comparable with this contract and in satisfactory operation for a period of not less than five years. Contractor must have an office within one (1) hour drive of the Facility. There shall be no logos or contractors/manufacturer’s identification or nameplates within each elevator car or hallways.

B. Should a conflict exist between the specifications, drawings or field conditions, the Contractor shall submit details of such conflicts at least seven (7) days prior to the bid proposal submission. No departures will be allowed without prior written approval. Any substitutions to the specified product must be presented prior to the submission of a bid proposal and with the understanding that no substitutions will be allowed after contract award.

C. Controller Manufacturers:
1. Elevator Controls Inc. (ECI)

2. Motion Control Engineering (MCE)
3. Galaxy (GAL)
4. Approved Equal

D. Signal Manufacturers
1. EPCO
2. Innovation
3. Monitor
4. Approved Equal

E. Cab and Hoistway Door Manufacturers
1. Tyler
2. EDI/ECI
3. Gunderlin
4. Snap Cab
5. Approved Equal

F. Qualified Bidders:
1. State of New Jersey Pre-Qualified Contractors

2.02 OUTLINE OF EQUIPMENT

A. Elevators #1 and #2
1. Capacity: 2,500 pounds
2. Contract Speed: 150 fpm
3. Number of Stops: Five (5)
4. Number of Openings: Five (5) in line
5. Machine Location: Overhead
6. Machine Type: Geared Traction (new)
7. Type of Control: VVVF (new)
8. Operation: Microprocessor Control (new)
9. Platform Size: 6’-10” wide x 5’-4 1/4” deep (reuse existing)
10. Car Flare (Toe Guard): New retractable due to pit depth 4’-1”
11. Car and Hoistway Door Size: 3’-4” wide by 6’-11” high
12. Car and Hoistway Door Type: One Speed, Side Opening
13. New Car and Hoistway Door Operation: GAL, MOVFR Closed-loop, High-speed, heavy duty Door Operating Equipment.
14. Cab Enclosure/Interior: New
15. Car Operating Panel: New
16. Hall Call Stations: New
17. Hall Position Indicator: New at Floor 1 landing only.
18. Hall Lanterns: New, above entrances at floors B, 2, 3, and 4.
19. Communication System: New Hands-free ADA Telephone.

B. Provide equipment to fit in existing space conditions.

C. Geared traction machine: Provide new geared hoist machines.

D. Deflector Sheave: Provide new located at the top of the hoistway.

E. Motor: Provide new VVVF type AC hoisting motor and Type "F" insulation or better.

F. New hoist cables are to be provided. Provide hoist cable guards at the car and counterweight drop side of the hoisting machine sheave (as applicable) to prevent accidental contact with the hoisting cables. The guard shall extend from the point where the hoisting cables penetrate the machine room floor slab to a point beyond where the cables contact the traction and deflector sheaves. The guards shall be constructed so as to conceal pinch points between cables and sheave grooves

G. Controller: Provide new locked enameled enclosed controller panels in a NEMA 12 enclosure. Provide air to air compact cabinet cooler, attached to each controller, manufactured by NOREN Products, Inc. or approved equal. Provide permanently marked symbols or letters identical to those on wiring diagrams adjacent to each component. The control system shall be closed loop feedback variable voltage type, which will govern the starting, stopping and direction of each elevator. Design to limit current, suppress noise and not to produce voltage transients back into the mainline feeders. Provide necessary filter/chokes and isolation to effectively prevent noise transmission to any occupied space. Controller enclosure is to be provided with a minimum twenty-four (24) inch fluorescent light fixture.

H. Selectors: Provide solid-state type electrically or mechanically coupled to car.

I. Encoder: Provide solid-state, optical, digital-count type, mechanically coupled to car via a slotted tape with drive sheaves and a pit-tensioning sheave or driven from the car governor. Optical, inductive pulse or mechanical target-type tape encoder mounted in the hoistway is acceptable.

J. Governor: A new digital governor and governor cable is to be provided for each elevator. The system shall include the governor and a weighted tension sheave. The governor shall be calibrated to operate in accordance with Code requirements and tripping speed shall be set to coincide with the rated speed of the elevator. The pull through on the governor shall be set to work in accordance with the pull through requirements of the safety. The overspeed protective device switch shall operate upon overspeed of the governor. The overspeed switch shall remove power from the driving machine motor and brake before application of the safety. The governor shall be tested with the safety and results documented with the inspecting authority.

2.03 SYSTEMS

A. Non-Proprietary Microprocessor Control
1. Momentary pressure of hall button shall bring a car to corresponding landing. After car stops in response to hall call, a time relay shall render car inoperative from hall button, for a predetermined interval. Pressure on hall button at the landing where the car is standing shall cause the door to open.

2. The following features are to be incorporated into the control system:
   a. Heavy Up Incoming Traffic
   b. Heavy Down Traffic
   c. Two Way Traffic Conditions
   d. Delayed Car Feature
   e. Adjustable Door Dwell Time
   f. Fire Service Phase I & II
   g. Anti-Nuisance Operation
   h. Load Weighing Bypass
   i. Nudging
   j. Hoistway Access
   k. Emergency Power Operation

3. Car and hoistway doors shall open automatically when car stops in response to a car or hall call.
4. Doors shall close after a predetermined interval after opening unless closing is interrupted by car door reversal device or door open button in car.
5. Fire Service Control shall override any Special Service Operation.

B. Independent Service: Provide controls to remove elevator from normal operation and provide control of the elevator from car buttons only. Car shall travel at contract speed and shall not respond to corridor calls.

C. Car Top Operation: Provide new inspection and maintenance control station mounted on each cartop. The station is to include up and down buttons, inspection operation button, stop switch, GFI duplex outlet, work light and guard along with audible and visual signal to comply with fire service control.

D. Emergency Recall Operation (Fire Service): Provide operation and equipment per Code requirements. Provide a three-position key switch, marked "BYPASS-OFF-ON", at the main fire egress lobby. Any additional switches for control panels of alternate recall floors are to be two-position, marked "OFF-ON". All elevators are to be provided with Phase II operation. Contractor shall provide relays, wiring, and terminal strips to receive signals from ionization detectors.

E. Emergency Car Lighting and Alarm System: Unit shall provide emergency light in car upon failure or interruption of normal car lighting. Emergency lighting unit shall provide a minimum illumination of 0.2 foot-candle at 4 feet above car floor approximately one (1) foot in front of car operating panel for not less than 4 hours. Battery shall be 6-volt minimum, sealed rechargeable lead acid or equal. Battery charger shall be capable of restoring battery to full charge within sixteen (16) hours after resumption of normal power. Provide an external means for testing battery, lamps, and alarm bell.

F. Emergency Power operation shall be arranged such that the elevator system shall sense a loss of normal power at each automatic transfer switch on an individual basis. Upon power loss at one transfer switch (partial power failure), no more than one (1) elevator served by that transfer switch shall be capable of operating at one time. Upon loss of power at the elevator transfer switch, the

elevators shall be interlocked such that no more than one (1) elevator may operate simultaneously from the emergency power system. Selection of individual elevator shall made by selector keyswitch located in lobby hall station. Sensing contacts at each transfer switch and related wiring to each elevator machine room shall be by the Electrical Contractor. The Elevator Contractor shall coordinate with the Electrical Contractor to determine the type of sensing contacts required (normally open or normally closed) and the contact rating. Refer to the electrical drawings for number of transfer switches and elevators served.

2.04 OPERATION PERFORMANCE

A. The control system shall provide smooth acceleration and deceleration with ¼" leveling accuracy at all landings, from no load to full rated load in the elevator, under normal or unloading conditions. The self-leveling shall, within its zone, be entirely automatic and independent of the operating device and shall correct for overtravel and under travel. The car shall remain at the landing irrespective of load. Clearance between the car sill and the hoistway landing shall not exceed 1 1/4 inch.

B. The door open time for elevators is not to be less than 3.0 fps.

C. The door close time shall be based on the Code requirements with a door delay feature. The door delay is the minimum acceptable time from notification that a car is answering a call (lantern and audible signal) until the doors of the car start to close. Time shall be calculated by the following equation:
1. T = D/(1.5ft/s)
2. T = Total time in seconds.
3. D = Distance from a point in the lobby sixty (60) inches directly in front of the hall station to the centerline of the door opening.

D. Car Call: The minimum acceptable time for doors to remain fully open shall not be less than 5 seconds.

E. The speed of the elevator shall not vary +/- 5% under loading conditions.

F. Elevator is to be statically and dynamically balanced. With empty car, maximum pressure on any roller guide shall not exceed ten (10) pounds, with the elevator located at any point in the hoistway.

G. Prior to final acceptance and prior to the termination of the maintenance period, the elevators shall be adjusted as required to meet these performance requirements.

2.05 HOISTWAY EQUIPMENT

A. Guide Rails: Car and Counterweight-Planed steel, standard T-sections. Existing guide rails are to be retained. The rails and brackets are to be examined and re-secured as necessary. The machine surface of the rails is to be thoroughly

cleaned. All rail joints shall be filed smooth, and the alignment checked and adjusted as necessary to within 1/8” top to bottom and face-to-face. The unmachined portion of the rails are to be cleaned and painted.

B. Car and Counterweight roller guide assemblies. Provide new ELSCO or approved equal roller guide assemblies.

C. Buffer: Car and Counterweight- Existing spring type buffers are to be retained. d. Each buffer is to be tested to conform compliance with Code requirements.

D. Counterweights: Retain existing. The entire assembly shall be thoroughly inspected, and fastenings of all members shall be checked and secured. The counterweight shall be rebalanced with the elevator car so that it is equal to the weight of the elevator car plus 40% of the rated car capacity. Additional weights shall be provided and the same shall be held securely in alignment with the existing rods.

E. Hoist and Governor Ropes: Provide new 8 x 19 sealed construction traction steel type for the hoist ropes and provide new 8 x 25 filler wire type for governor rope; fasten with adjustable shackles. Provide hoist ropes guards.

2.06 SAFETY

A. Safety: Retain existing. The safety is to be cleaned, overhauled, and tested with rated load and at contract speed with the results documented with the governing authority. The safety shall be activated by the speed governor located in the machine room. The safety shall stop the elevator whenever excessive descending speed is experienced and means shall be provided to cut off power from the motor and apply brake prior to application of the safety. If necessary, the safety shall be modified and adjusted so that its operation complies with the requirements of the ASME Code.

B. Automatic Terminal Stopping Device: New terminal stopping devices shall be provided at the top and bottom of the elevator hoistway and shall be operated by a fixed cam attached to the elevator. The switches shall be independent of any other stopping device and shall cut off power from the driving machine motor and brake.

C. Wiring:
1. Conductors: Provide copper insulated wiring with flame retarding and moisture resisting outer cover. Install in galvanized metal wireways and raceways. Conductors from shaft riser to door interlocks shall be SF-2 type or equal, maximum operating temperature 392 degrees F. All terminations shall be insulated to maintain integrity of wiring. Flexible conduit may be used for short connections. Provide 10% spare conductors throughout.
2. Trail Cables: UL labeled fire and moisture resistant outer braid and steel supporting strand. Provide four pairs of shielded communication wires and car lighting circuits. Prevent cables from rubbing or chafing against hoistway or car items.

3. Remote Wiring: Provide wiring between machine room, hoistway and remote locations of guard, security, life safety and fire control panels.
4. Provide five (5) pair of shield wires and two (2) RG-59 type coaxial cables.
5. Work Light and Duplex Receptacles: Provide on top and bottom of car with 110volt GFI receptacle and work light with guard.

2.07 DOOR AND ENTRANCE EQUIPMENT

A. All fastenings of the entrance equipment shall be made secured. Hoistway door panels and sight guards are to be replaced with new 1 1/2hr. “B” label door panels. Finish is to be baked enamel in a color selected by the owner. Existing entrance frame assemblies are to be retained, cleaned, and electrostatically painted to match new hoistway door panels.

B. All sills are to be cleaned to insure proper operation.

C. Each door panel is to be provided with two (2) new gibs. These new gibs are to be UL labeled and designed to be replaced without removing the door panels.

D. Existing fascia, dust covers, hanger covers, and toe guards are to be retained. Replace any components that are missing to meet code, clean and paint black enamel. If required, provided reinforcement as necessary or replace those components as deemed necessary. Any components that are missing are to be provided with new. All equipment is then required to be painted with black enamel. Six (6) inch high numerals designating the appropriate floor shall be stenciled at six (6) foot intervals.

E. New door stops, and rubber bumpers shall be mounted to the top and bottom of each strut angle to cushion and limit the extreme travel of the door panels.

F. Provide new die cast jamb markings on the sides of each entrance frame and mounted sixty (60) inches from the finish floor. Each marking shall be a minimum of two (2) inch high numerals with Braille.

G. All car door operating equipment, including car doors, operators, door tracks, interlocks, wiring and all related door operating equipment is to be completely removed and replaced with new incorporating GAL’s MOVFR closed loop operator.

H. Existing hoistway door tracks, hangers and closers are to be replaced.

I. New electro-mechanical interlocks with appropriate wiring shall be provided at all hoistway entrances. Provide escutcheons to achieve emergency release provisions at all floors.

J. The car and hoistway doors shall be designed in such a way that the doors cannot be opened more than four (4) inches from within the car when the car is outside the unlocking zone in accordance with ANSI A.17.1.

2.08 CAR EQUIPMENT

A. Car Frame: Retain existing. All components are to be checked and secured as necessary.

B. Passenger Platforms: Retain existing. Platform is to be checked and secured as necessary. Ensure subfloor condition is acceptable, and in those instances where the plywood is unacceptable, advise owner of condition that exists.

C. Toe Guards: Provide new retractable due to low pit depth and are to be painted with black enamel.

D. Hangers and tracks: Replace new.

E. Door Operator: Provide New GAL, MOVFR, high speed, heavy-duty master, close loop electric power door operator to automatically open and close the car and hoistway doors. The doors shall be capable of smooth and quiet operation without slam or shock.
   1. Opening speed shall not be less than 3.0 f.p.s.
   2. Hoistway doors shall be automatically closed by an auxiliary closing device if car leaves the landing zone.
   3. In case of power interruption, it shall be possible to manually operate car and hoistway doors from inside the cab.
   4. Door Protection: Electronic Entrance Detector Screen: Provide 3D electronic door edge device, which projects an infrared curtain of light guarding the door opening. Arrange to reopen doors if one beam of the curtain is penetrated. Unit shall have Transmitters and Receivers spaced at a minimum distance to provide the maximum amount of protection within the height of the doorway. Systems which have the availability to turn Off or On individual zones within the curtain will not be allowed.
   5. Differential door timing feature: Provide adjustable timers to vary the time that the doors remain open in response to a car or hall call. The doors shall remain open for one second in response to a car call and five to eight seconds for a hall call. This time shall be reduced to 2 second if the door detection is interrupted. The doors shall remain open if passengers are crossing the threshold.
   6. Nudging: When doors are prevented from closing for 20 seconds due to failure of the light ray or obstruction, the doors shall close at reduced speed and a buzzer shall sound.
   7. Car Top Railing: Provide 42”, Code compliant car top railing as required.

F. Car Door Contacts: Electrical contacts shall prevent the operation of the elevator by normal operating devices unless car doors are closed or within tolerances allowed by Code.

G. Passenger Car Doors: Provide new car doors in stainless steel #4 satin finish.

H. Cab Interiors/Enclosures: Retain cab shell, provide new steel cab interiors. The following is the basis of design: SNAPCAB CORPORATE 1.

1. Steel cab shell retain, remove side exit hardware, and secure panels.
2. Walls panels: Plastic laminate finish WILSON ART WILD CHERRY.
3. Front returns, entrance columns and transom reclad in 316 stainless steel #4.
4. Suspended ceiling 316 stainless steel #4 panels.
5. Lighting: Downlights LED.
6. Frieze reveals and base 316 stainless steel #4.
7. Vents: New
8. Handrails ¼" x 2" flat bar with curbed ends on 3 sides stainless steel #4.
9. Base: 316 stainless steel #4.
10. Car sill: stainless steel with trash slots.
11. Cab flooring: Textured raised rubber flooring in a color of Owner's choice.
12. Two (2) speed exhaust fan.
13. Provide one (1) set of protective pads in a color of the Owner's choice.

2.09 SIGNALS AND FIXTURES

A. Provide new signal and operating fixtures in stainless steel #4 brushed finish.

B. All fixtures are to incorporate tamperproof fasteners. Faceplates are to be oversized to cover the existing cutouts. The areas where items are being removed and not replaced are to be covered with a blank 10-gauge stainless steel cover.

C. Car Operating Panel:
1. Provide car operating panel in return panel. Panel shall have illuminating pushbuttons numbered to conform to floors served. Buttons shall light to show registration and extinguish when car stops in response to a call. Buttons shall be raised 1/8 inch above the faceplate. Panel shall include an alarm bell button, DOOR OPEN and DOOR CLOSE button. All operating controls shall be located no higher than 54" above the car floor and 35" for alarm button. Provide Phase II emergency fire service switch, fire jewel and ADA telephone. Provide oversized panel if necessary due to the size of the existing cutout.
2. Braille/Arabic designations shall be die cast and flush with inconspicuous mechanical mounting.
   a. The plaques shall have numerals and background in a finish selected by the architect/owner.
3. All devices are to be vandal resistant.
4. Fire Service Phase I & II requirements.
5. Provide within panel a service cabinet with a locked flush hinged door and integral certificate frame.
   a. Certificate Frame shall have durable Plexiglas window and be accessible from backside of locked door. Minimum window size to be 7" wide by 3" high.
   b. Cabinet shall contain the following key switch type controls:
      1) A light switch.
      2) Two speed fan keyswitch.

3) Inspection switch, conforming with the ANSI Code.
4) Independent service switch.
5) A duplex 110-volt, A.C. convenience outlet.
6) Fire Service keyswitch.
7) Hoistway Access enable keyswitch
8) Two (2) spare switches.
9) Emergency Light test button

6. Engrave the car operating panels with the following:
   a. No Smoking. Minimum one (1) inch high lettering.
   b. In Case of Fire Do Not Use Elevator.
   c. Elevator Number: Minimum one (1) inch high lettering.
   d. Elevator Capacity: Minimum one (1) inch high lettering.
   e. Firefighters Operating Instructions. Minimum 1/8-inch-high lettering.

D. Car Position Indicator: Provide digital readout type with 2-inch high (minimum) indications within each operating panel. Fixture is to incorporate direction arrows and audible floor passing signal.

E. Hall Lanterns: Provide new surface mount Hall lanterns at floors B, 2, 3 and 4 equipped with illuminated UP and DOWN signal arrows, as applicable. Provide units projecting from faceplate for ease of angular viewing. Match materials, finishes, and mounting method with hall stations. In conjunction with each lantern, provide an adjustable electronic chime signal to indicate that a car is arriving in response to a hall call and to indicate direction of car travel. Signal shall sound one for up direction of travel and twice for down direction.

F. Bell Alarm System: Bell alarm system for each elevator shall be properly located within the building and audible outside hoistway when activated by the EMERGENCY STOP switch or the ALARM call button on each car control station.

G. Hall Buttons: Provide vandal resistant hall pushbuttons. Stations shall include surface mounted faceplate. Centerline of pushbutton to be at 3'-6" above the finished floor. Buttons shall be raised 1/8 inch above the faceplate. Provide Code required Phase II key switch and operational instructions engraved on the faceplate, Emergency Power signal and selector keyswitch with engraving at the main lobby. Appendix “O” fire signs shall be integral within the faceplate, at all floors. Faceplate finish to be stainless steel #4 finish.

H. Digital Hall Position Indicator and Lanterns Combination: Provide surface mount vandal resistant fixtures at floor 1 only. Position indicator is to incorporate lanterns and direction arrow. Fixtures are to be provided in #4 stainless steel. Hall position indicators to be centered over entrances at main lobby landing and adjacent to openings as per contract drawings.

I. Hoistway Access Keyswitches to be installed at terminal landings at locations as per contract drawings.

2.01 EMERGENCY COMMUNICATION

A. Provide two-way audio communication incorporated in the car operating panel compliant with ASME A17.1 2019 standards. Calls are to be activated via the Telephone call button located on the car operating panel and located 35" above the finished elevator floor. Communication is to be established between the cab interior and authorized personnel.

B. The system needs the ability to post messages to car operating panel and respond to these messages by passengers who cannot communicate verbally. System is to be provided by Rath Communication SmartView or approved equal.

C. A camera is to be installed that will allow the observation of all passengers by the authorized personnel in the event of an entrapment.

D. Car operating panel is to have engraved and Braille instructions on the use of the emergency communication system.

E. Provide a visual indication the consists of a jewel that illuminates once the authorized personnel have established communication. Instructions under the visual indicator or within the jewel shall read, "WHEN FLASSING HELP IS ON THE WAY".

F. Monitor communication system at regular intervals. Should a communication failure occur a jewel mounted at the designated landing is to be illuminated. Jewel to read, "COMMUNICATION FAILURE".

G. Emergency communication system is to remain in operation in the event of a power outage.

H. Provide two-way verbal communication between elevator cab and control room.

I. Note, an internet connection is required in the elevator control room to support the emergency communication system

PART 3 EXECUTION

3.01 EXAMINATION

A. The contractor shall examine the supporting structure and the conditions under which the work shall be installed and notify the contractor of any conditions

detrimental to the proper and timely completion of the work. Do not proceed with the installation until unsatisfactory conditions have been corrected and are acceptable.

B. Verify dimensions of supporting structure at the site by accurate field measurements. The work shall be accurately fabricated and fitted to the structure. The contractor shall satisfy himself by review of the working drawings and field observation that the clearances and the alignments are proper for the installation of this work.

C. Coordinate work with the work of other trades and provide items to be placed during the installation at the proper time to avoid delays in the overall work. Use contractor's benchmarks where necessary.

D. The elevator contractor shall review the new electrical system and verify all conditions for proper installation of this work. Verify the size of all feeders and related equipment and furnish all equipment for proper operation. The contractor shall be responsible for furnishing any electrical changes or upgrades required.

3.02 FIELD QUALITY CONTROL

A. Tests:
1. Perform as required by Code and as required by authorities having jurisdiction.
2. Provide labor, materials, equipment, and connections.
3. All test results shall be documented and submitted for approval.
4. Repair or replace defective work as required.
5. Pay for restoring or replacing damaged work due to tests.

B. Final Inspection: When all work is completed, and tested to the satisfaction of the contractor, the contractor shall notify the Owner in writing that the elevators are ready for final inspection and acceptance test. A testing and inspection date shall be arranged with the appropriate governing authority. The proper operation of every part of the elevator system and compliance with contract requirements, including compliance with all applicable requirements of the Code, shall be demonstrated to the Owner. Furnish all test instruments, weights, and materials, required at the time of final inspection. The following tests shall be made on each elevator at the time of final inspection:
1. Test Period: The elevator shall be subjected to a test for a period of one-hour continuous run, with full-specified load in the car. During the test run, the car shall be stopped at all floors in both directions of travel for a standing period of 10 seconds per floor.
2. Speed Load Tests: The actual speed of the elevator car shall be determined in both directions of travel with full contract load and with no load in the elevator car. Speed shall be determined by a tachometer. The actual measured speed of elevator car with full load shall be within 5% of rated speed. The maximum difference in actual measured speeds obtained under the various conditions outlined between the "UP" and the "DOWN" directions shall be checked.

3. Floor-to-floor times with no load in the car, balanced load and full carload shall be checked.
4. Car Leveling Tests: Elevator car leveling devices shall be tested for accuracy of landing at all floors with no load in car, balanced load in car, and with a full load in car, in both directions of travel. Accuracy of floor landing plus or minus 3 inches shall be determined both before and after the full-load run test.
5. Insulation Resistance Tests: The complete wiring systems of the elevator shall be free from short circuits and grounds, and the insulation resistance shall be determined by use of a "Megger." Conductors shall have an insulation resistance of not less than one megohm between each conductor and ground and between each conductor and all other conductors.

C. Final Systems Tests for Smoke Detection/Elevator Recall, Emergency Power Operation: After work is completed, conduct a final test of entire system.

D. Reinspection: If any equipment is found to be damaged or defective, or if the performance of the elevator does not conform to the requirements of the contract specifications or the Safety Code, no approval or acceptance of elevators shall be issued until all defects have been corrected. When the repairs and adjustments have been completed and the discrepancies corrected, the Owner shall be notified, and the elevator will be re-inspected. Rejected elevators shall not be used until they have been re-inspected and approved. All costs associated with reinspection are the responsibility of the Contractor.

E. The elevator hoistway, pits and equipment rooms shall be thoroughly cleaned. All elevator equipment located with the hoistway and machine room, along with machine room floor shall be painted with two coats of deck enamel after all adjusting is completed. Provide dielectric matting around all controllers.

3.03 INSTRUCTIONS AND DEMONSTRATION TO OWNER

A. The Contractor shall provide eight (8) hours of onsite demonstration and instructions to the owner’s personnel upon completion of the elevator installation. Instructions are to include safety procedures, proper operation of all equipment, routine maintenance procedures and operation of building management systems that interact with the elevators.

3.04 ADJUSTING AND CLEANING

A. All equipment shall be adjusted prior to final testing and acceptance.

B. Paint exposed work soiled or damaged during installation. Repair to match adjoining work prior to final acceptance.

END OF SECTION

This page intentionally left blank

SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR SPRINKLER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTs

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Metraflex Company.
3. Pipeline Seal and Insulator, Inc.
4. Proco Products, Inc.
5. Or approved equal

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Plasticor Stainless steel.

3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inchannular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inchannular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07 92 00 "Joint Sealants."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

    a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

2. Exterior Concrete Walls below Grade:

    a. Piping Smaller Than NPS 6 Cast iron-pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

    a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inchannular clear space between piping and sleeve for installing sleeve-seal system to make installation water tight.

4. Concrete Slabs above Grade:

    a. All Piping: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.

5. Interior Partitions:

    a. All Piping: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.

END OF SECTION

SECTION 210518 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.

1.3 DEFINITIONS

A. Existing Piping to Remain: Existing piping that is not to be removed and that is not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Brass Craft Manufacturing

B. Dearborn Brass

C. Keeney Manufacturing Company

D. Or approved equal

2.2 ESCUTCHEONS

A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Stainless-Steel Type: With polished stainless-steel finish.

C. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

D. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.

E. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

F. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed hinge; and spring-clip fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
b. Chrome-Plated Piping: One-piece steel with polished, chrome-plated finish.
c. Insulated Piping: One-piece steel with polished, chrome-plated finish.
d. Insulated Piping: One-piece stainless steel with polished stainless-steel finish.
e. Insulated Piping: One-piece cast brass with polished, chrome-plated finish.
f. Insulated Piping: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
g. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
h. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stainless steel with polished stainless-steel finish.
i. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
j. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
k. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
l. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stainless steel with polished stainless-steel finish.
m. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast brass with polished, chrome-plated finish.
n. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
o. Bare Piping in Unfinished Service Spaces: One-piece steel with polished, chrome-plated finish.

p. Bare Piping in Unfinished Service Spaces: One-piece cast brass with polished, chrome-plated finish.
q. Bare Piping in Unfinished Service Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
r. Bare Piping in Equipment Rooms: One-piece steel with polished, chrome-plated finish.
s. Bare Piping in Equipment Rooms: One-piece cast brass with polished, chrome-plated finish.
t. Bare Piping in Equipment Rooms: One-piece stamped steel or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor plate.
2. Existing Piping: Split floor plate.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 210518

SECTION 210529 - HANGERS AND SUPPORTS FOR FIRE SUPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal hanger-shield inserts.
5. Fastener systems.
6. Equipment supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Include design calculations for designing trapeze hangers.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

B. Pipe Welding Qualifications: Qualify procedures and operators according to 2015 ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Div 1- Quality Requirements," to design trapeze pipe hangers and equipment supports.

B. Structural Performance: Hangers and supports for fire-suppression piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

C. NFPA Compliance: Comply with NFPA 13.

D. UL Compliance: Comply with UL 203.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: Factory-fabricated components, NFPA approved, UL listed, or FM approved for fire-suppression piping support.
2. Galvanized Metallic Coatings: Pregalvanized or hot-dip galvanized.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with NFPA-approved, UL-listed, or FM-approved carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: NFPA-approved, UL-listed, or FM-approved threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: NFPA-approved, UL-listed, or FM-approved, insert-wedge-type anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
   1. Indoor Applications: Zinc-coated steel.
   2. Outdoor Applications: Stainless steel.

2.5 EQUIPMENT SUPPORTS

A. Description: NFPA-approved, UL-listed, or FM-approved, welded, shop- or field-fabricated equipment support, made from structural-carbon-steel shapes.

2.6 MATERIALS

A. Aluminum: ASTM B221.

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout, suitable for interior and exterior applications.

   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with installation requirements of approvals and listings. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A36/A36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal strut systems.

D. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Install in accordance with approvals and listings.
2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions. Install in accordance with approvals and listings.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment, and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections, so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in Section 099123 "Interior Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with NFPA requirements for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Horizontal-Piping Hangers and Supports: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Steel Pipe Clamps (MSS Type 4): For suspension of NPS 1/2 to NPS 24 if little or no insulation is required.
3. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 .
4. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 .
5. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
6. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.

H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

I. Hanger-Rod Attachments: Comply with NFPA requirements.

J. Building Attachments: Comply with NFPA requirements. Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. C-Clamps (MSS Type 23): For structural shapes.
3. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

K. Comply with NFPA requirements for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

L. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

M. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 210529

SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

D. Valve Schedules: Valve numbering scheme.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch-thick, with predrilled holes for attachment hardware.
2. Letter Color: White
3. Background Color: Red.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction according to ASME A13.1.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping

E. Pipe-Label Colors:

1. Background Color: Safety Red.
2. Letter Color: White.

2.3 VALVE TAGS

A. Description: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032 inch thick, with predrilled holes for attachment hardware.
2. Fasteners: Brass wire-link chain, beaded chain or S-hook.

3. Valve-Tag Color: Safety Red.
4. Letter Color: White.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit a view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes including pipes where flow is allowed in both directions.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:

1. Valve-Tag Size and Shape:
   a. Wet-Pipe Sprinkler System: 2 inches, round.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 210553

SECTION 211313 WET PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Related Requirements:
   1. Section 210529 "Hangers and Supports for Fire Suppression Piping".

1.2 CITED STANDARDS

A. ASTM International:

1.	ASTM A53	Standard for Welded and Seamless Steel Pipe
2.	ASTM A312	Standard for Seamless and Welded Stainless Steel Pipe
3.	ASTM A795	Standard for Black Steel Pipe for Fire Protection

B. National Fire Protection Association (NFPA):

1.	NFPA 13	Standard for the Installation of Sprinkler Systems
2.	NFPA 25	Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
3.	NFPA 72	National Fire Alarm Code

C. Codes:
   1. International Building Code
   2. International Fire Code

D. Certification Agency:

1.	FM	Factory Mutual
2.	UL	Underwriters Laboratories, Inc.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet pipe sprinkler systems.

   1. Include plans, elevations, sections, and attachment details.
   2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified NJ Professional Engineer, responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. HVAC piping and ductwork
3. Items penetrating finished ceiling include the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.

B. Qualification Data: For qualified Installer. Sprinkler fitters: shall work under the direct responsible supervision of a fire sprinkler contractor licensed in the state of NJ. Furnish certification of qualifications of the fire sprinkler filter installer by indicating his previous training and experience.

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

E. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.6 MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

    a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

1.8 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with NFPA 13.

B. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

C. Delegated Design: Engage a qualified professional engineer to design the sprinkler systems.

1. Available fire-hydrant flow test records indicate the following conditions:

    a. Date: See contract drawings

    b. Contractor shall perform new hydrant flow test if date of previous test exceeds 1 year from date of hydraulic calculations.

2. Sprinkler system design shall be approved by authorities having jurisdiction.

    a. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
    b. Sprinkler Occupancy Hazard Classifications:

        1) Building Areas: See plans

3. Minimum Density for Automatic-Sprinkler Piping Design:
    a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
    b. Ordinary-Hazard Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
    c. Ordinary-Hazard Group 2 Occupancy: 0.2 gpm over 1500-sq. ft. area.
    d. Extra Hazard Occupancy Group 1: 0.3 gpm over 2500 sq ft area.

4. Maximum Protection Area per Sprinkler: According to UL listing.
5. Maximum Protection Area per Sprinkler:
    a. Office Spaces: 225 sq. ft.
    b. Storage Areas: 130 sq. ft.
    c. Mechanical Equipment Rooms: 130 sq. ft.
    d. Electrical Equipment Rooms: 130 sq. ft.
    e. Hazardous Storage: 100 sq. ft.

f. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

A. Standard-Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 40, Black-Steel Pipe: ASTM A 135/A 135M; ASTM A 795/A 795M, Type E; or ASME B36.10M wrought steel, with wall thickness not less than Schedule 40. Pipe ends may be factory or field formed to match joining method.

C. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

D. Malleable- or Ductile-Iron Unions: UL 860.

E. Cast-Iron Flanges: ASME 16.1, Class 125.

F. Grooved-Joint, Steel-Pipe Appurtenances:

1. Pressure Rating: 250-psig minimum.
2. Galvanized Painted Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting, with dimensions matching steel pipe.
3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.2 SPECIALTY VALVES

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating:

1. Standard-Pressure Piping Specialty Valves: 175-psig minimum.

C. Body Material: Cast or ductile iron.

D. Size: Same as connected piping.

E. End Connections: Flanged or grooved.

2.3 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating: 175 psig.

B. Check Valves:

1. Standard: UL 312.
2. Pressure Rating: 250 psigminimum.
3. Type: Swing check.
4. Body Material: Cast iron.
5. End Connections: Flanged or grooved.

C. Iron OS&Y Gate Valves:

1. Standard: UL 262.
2. Pressure Rating: 250 psig minimum.
3. Body Material: Cast or ductile iron.
4. End Connections: Flanged or grooved.

D. Indicating-Type Butterfly Valves:

1. Standard: UL 1091.
2. Pressure Rating: 175 psigminimum.
3. Valves NPS 2 and Smaller:

a. Valve Type: Ball or butterfly.
b. Body Material: Bronze.
c. End Connections: Threaded.

4. Valves NPS 2-1/2and Larger:

a. Valve Type: Butterfly.
b. Body Material: Cast or ductile iron.
c. End Connections: Flanged, grooved, or wafer.

2.4 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig.

2.5 EXPOSED-TYPE FIRE-DEPARTMENT CONNECTION

A. Standard: UL 405.

B. Hose swivel-angled, 90 degree, exposed cast brass body fire department connection with double drop clappers.

C. Outlet Size: NPS 4 threaded.

D. Inlet Size: NPS 2-1/2”, dual inlet with drop clappers and hose swivels, NFPA 1963.

E. Inlet supply: 250 gpm for each inlet.

F. Pressure Rating: 175 psig minimum.

G. Provide and install approved check valve and automatic ball-drip valve at each FDC connection.

2.6 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Standard: UL 213.
2. Pressure Rating: 175-psig minimum.
3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
4. Type: Mechanical-tee and -cross fittings.
5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
7. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded or grooved.

C. Branch Line Testers:

1. Standard: UL 199.
2. Pressure Rating: 175 psig.
3. Body Material: Brass.

4. Size: Same as connected piping.
5. Inlet: Threaded.
6. Drain Outlet: Threaded and capped.
7. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
2. Pressure Rating: 175-psig minimum.
3. Body Material: Cast- or ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Standard: UL 1474.
2. Pressure Rating: 250-psig minimum.
3. Body Material: Steel pipe with EPDM-rubber O-ring seals.
4. Size: Same as connected piping.
5. Length: Adjustable.
6. Inlet and Outlet: Threaded.

F. Flexible Sprinkler Hose Fittings:

1. Standard: UL 1474.
2. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
3. Pressure Rating: 175-psig minimum.
4. Size: Same as connected piping, for sprinkler.

2.7 SPRINKLERS

A. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

B. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Special Coatings: Wax and corrosion-resistant paint.

E. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

F. Ceiling Mounting: Chrome-plated steel, one piece, or flat Chrome-plated steel, two piece, with 1-inch vertical adjustment for the Vestibule, Lobby and Stair B. Painted white for acoustical ceiling tiles.

G. Sprinkler Guards:

1. Standard: UL 199.
2. Type: Wire cage with fastening device for attaching to sprinkler.

2.8 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

1. Standard: UL 346.
2. Water-Flow Detector: Electrically supervised.
3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
4. Type: Paddle operated.
5. Pressure Rating: 250 psig.
6. Design Installation: Horizontal or vertical.

C. Pressure Switches:

1. Standard: UL 346.
2. Type: Electrically supervised water-flow switch with retard feature.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design Operation: Rising pressure signals water flow.

D. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled valve is in other than fully open position.
5. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application

2.9 PRESSURE GAGES

A. Standard: UL 393.

B. Dial Size: 3-1/2- to 4-1/2-inch diameter.

C. Pressure Gage Range: 0 to 300 psig.

D. Label: Include "WATER" label on dial face.

PART 3 - EXECUTION

3.1 WATER-SUPPLY CONNECTIONS

A. Install shutoff valve, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.

B. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Install seismic restraints on piping. Comply with NFPA 13 requirements for seismic-restraint device materials and installation.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal and install where they are not subject to freezing.

N. Fill sprinkler system piping with water.

O. Install sleeves for piping penetrations of walls, ceilings, and floors.

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. Install valves in vertical position for proper direction of flow, in main supply to system.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

B. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.6 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 210553 "Identification for Fire Suppression Piping and Equipment."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.10 PIPING SCHEDULE

A. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends, cast-iron threaded fittings, and threaded or grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 8, shall be the following:

1. Schedule 40 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.11 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers with sprinkler guard
2. Rooms with Suspended Ceilings: Concealed Pendent

END OF SECTION

SECTION 213114 - FIRE PUMP CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, performance curves, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each controller, from manufacturer.

B. Source quality-control reports.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 20, "Installation of Stationary Pumps for Fire Protection."

PART 2 - PRODUCTS

2.1 FIRE PUMP CONTROLLER

A. Manufacturers: Cutlerhammer, Eaton, Firetrol or approved equal.

B. General Requirements for Controllers:

1. Comply with NFPA 20 and UL 218
2. Listed by an Nationally Recognized Testing Laboratories (NRTL) for electric-motor driver for fire-pump service.
3. Combined automatic and nonautomatic operation.
4. Factory assembled, wired, and tested; continuous-duty rated.
5. Service Equipment Label: NRTL labeled for use as service equipment.
6. NEMA 4X enclosure.

C. Method of Starting:

1. Pressure-switch actuated.

    a. Water-pressure-actuated switch and pressure transducer with independent high- and low-calibrated adjustments responsive to water pressure in fire-suppression piping.
    b. System pressure recorder, electric ac driven, with spring backup.
    c. Programmable minimum-run-time relay to prevent short cycling.
    d. Programmable timer for weekly tests.

2. Magnetic Controller: soft start type.
3. Solid-State Controller: Reduced-voltage type.
4. Emergency Start: Mechanically operated start handle that closes and retains the motor RUN contactor independent of all electric or pressure actuators.

D. Method of Stopping: Automatic and non-automatic shutdown after automatic starting.

E. Capacity: Rated for fire-pump-driver horsepower and short-circuit-current (withstand) rating equal to or greater than short-circuit current available at controller location.

F. Method of Isolation and Overcurrent Protection: Interlocked isolating switch and nonthermal MCCB; with a common, externally mounted operating handle, and providing locked-rotor protection.

G. Door-Mounted Operator Interface and Controls:

1. Monitor, display, and control the devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.
2. Method of Control and Indication:

    a. Microprocessor-based logic controller, with multiline digital readout.
    b. Membrane keypad.
    c. LED alarm and status indicating lights.

3. Local and Remote Alarm and Status Indications:

    a. Controller power on.
    b. Motor running condition.
    c. Loss-of-line power.

d. Line-power phase reversal.
e. Line-power single-phase condition.

4. Audible alarm, with silence push button.
5. Non-automatic START and STOP push buttons or switches.
6. Local alarm bell.

2.2 Jockey Pump Controller

A. UL 508 approved, across the line, jockey pump controller.

B. Manufactured by Cutlerhammer, Eaton, Firetrol or approved equal.

C. Enclosure shall be rated NEMA 4X.

D. Controller shall meet the requirements of NFPA 20.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fire-Pump Installation Standard: Comply with NFPA 20 for installation of equipment.

B. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

3.2 IDENTIFICATION

A. Identify system components. Comply with requirements according to NFPA 20.

3.3 FIELD QUALITY CONTROL

A. Test each fire pump with its controller as a unit.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. After installing components, assemblies, and equipment including controller, test for compliance with requirements.
2. Test according to NFPA 20 for acceptance and performance testing.
3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inchminimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Metraflex Company (The).
3. Pipeline Seal and Insulator, Inc.
4. Proco Products, Inc.
5. Or approved equal

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Plasticor Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inchannular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inchannular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07 92 00 "Joint Sealants."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6 Cast iron-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

    a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inchannular clear space between piping and sleeve for installing sleeve-seal system to make installation water tight.

4. Concrete Slabs above Grade:

    a. All Piping: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.

5. Interior Partitions:

    a. All Piping: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type, with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
f. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.3 SUMMARY

A. Section Includes:
1. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage, from manufacturer.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ernst Flow Industries.
   2. Palmer Wahl Instrumentation Group.
   3. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
   4. Weiss Instruments, Inc.
   5. WIKA Instrument Corporation - USA.
   6. Or approved equal

B. Standard: ASME B40.200.

C. Case: sealed type; stainless steel with 3-inchnominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.

H. Window: Plain glass or plastic.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Tel-Tru Manufacturing Company.
      b. Trerice, H. O. Co.
      c. Weiss Instruments, Inc.
      d. Winters Instruments - U.S.
      e. Or approved equal

   2. Standard: ASME B40.200.
   3. Case: Cast aluminum; 7-inchnominal size unless otherwise indicated.
   4. Case Form: Adjustable angle unless otherwise indicated.

5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass or plastic.
8. Stem: Aluminum and of length to suit installation.
   a. Design for Thermowell Installation: Bare stem.
9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 THERMOWELLS

A. Thermowells:
   1. Standard: ASME B40.200.
   2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
   3. Material for Use with Copper Tubing: CNR or CUNI.
   4. Material for Use with Steel Piping: CRES.
   5. Type: Stepped shank unless straight or tapered shank is indicated.
   6. External Threads: NPS 1/2, ASME B1.20.1 pipe threads.
   7. Internal Threads: 1/2, 3, with ASME B1.1 screw threads.
   8. Bore: Diameter required to match thermometer bulb or stem.
   9. Insertion Length: Length required to match thermometer bulb or stem.
   10. Lagging Extension: Include on thermowells for insulated piping and tubing.
   11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. AMETEK, Inc.; U.S. Gauge.
      b. Palmer Wahl Instrumentation Group.
      c. Trerice, H. O. Co.
      d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
      e. Weiss Instruments, Inc.
      f. WIKA Instrument Corporation - USA.
      g. Or approved equal

   2. Standard: ASME B40.100.
   3. Case: Liquid-filled type; cast aluminum or drawn steel; 4-1/2-inchnominal diameter.
   4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
   5. Match pressure connection size in first subparagraph below with gage attachment size.
   6. Pressure Connection: Brass, with NPS 1/4, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
   7. Movement: Mechanical, with link to pressure element and connection to pointer.
   8. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi

9. Pointer: Dark-colored metal.
10. Window: Glass.
11. Ring: Metal.
12. Accuracy: Grade C, plus or minus 3 percent of middle half of scale range.

B. Direct-Mounted, Plastic-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AMETEK, Inc.; U.S. Gauge.
b. Ashcroft Inc.
c. Palmer Wahl Instrumentation Group.
d. Trerice, H. O. Co.
e. Weiss Instruments, Inc.
f. WIKA Instrument Corporation - USA.
g. Or approved equal

2. Standard: ASME B40.100.
3. Case: Sealed type; plastic; 4-1/2-inchnominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Accuracy: Grade C, plus or minus 3 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass or stainless-steel needle, with NPS 1/, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

G. Install valve and snubber in piping for each pressure gage for fluids.

H. Install thermometers in the following locations:
   1. Inlet and outlet of each water heater.

I. Install pressure gages in the following locations:
   1. Building water service entrance into building.
   2. Inlet and outlet of each pressure-reducing valve.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:
   1. Sealed, bimetallic-actuated type.
   2. Industrial-style, liquid-in-glass type.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg.

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be one of the following:
   1. Sealed, direct-mounted, metal case.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be:
   1. Sealed, direct-mounted, metal case.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 100 psi.

B. Scale Range for Domestic Water Piping: 0 to 100 psi.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.3 SUMMARY

A. Section Includes:
1. Bronze ball valves.
2. Bronze swing check valves.
3. Bronze gate valves.
4. Bronze globe valves.
5. Iron gate valves.

B. Related Sections:
1. Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
2. Section 22 11 16 "Domestic Water Piping" for valves applicable only to this piping.
3. Section 22 13 19 "Sanitary Waste Piping Specialties" for valves applicable only to this piping.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY CONTROL

A. ASME Compliance:

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
1. Handwheel: For valves other than quarter-turn types.
2. Hand lever: For quarter-turn valves NPS 6and smaller, except for plug valves.

E. Valves in Insulated Piping: With 2-inchstem extensions and the following features:
1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Valve, Inc.
   b. Hammond Valve.
   c. Legend Valve.
   d. Milwaukee Valve Company.
   e. NIBCO INC.
   f. Red-White Valve Corporation.
   g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   h. Or approved equal

2. Description:
   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig
   c. CWP Rating: 600 psig.
   d. Body Design: Two piece.
   e. Body Material: Bronze.

f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

B. Two-Piece, Regular-Port, Bronze Ball Valves with Bronze Trim:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. American Valve, Inc.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Or approved equal.

2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Regular.

2.3 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Red-White Valve Corporation.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
i. Or approved equal

2. Description:
a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.4 BRONZE GATE VALVES

A. Class 125, RS Bronze Gate Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Valve, Inc.
      b. Hammond Valve.
      c. Milwaukee Valve Company.
      d. NIBCO INC.
      e. Powell Valves.
      f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      g. Or approved equal

   2. Description:
      a. Standard: MSS SP-80, Type 2.
      b. CWP Rating: 200 psig.
      c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
      d. Ends: Threaded or solder joint.
      e. Stem: Bronze.
      f. Disc: Solid wedge; bronze.
      g. Packing: Asbestos free.
      h. Handwheel: Malleable iron, bronze, or aluminum.

2.5 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Crane Co.; Crane Valve Group; Crane Valves.
      b. Hammond Valve.
      c. Milwaukee Valve Company.
      d. NIBCO INC.
      e. Red-White Valve Corporation.
      f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      g. Or approved equal

   2. Description:
      a. Standard: MSS SP-80, Type 1.
      b. CWP Rating: 200 psig.
      c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
      d. Ends: Threaded or solder joint.
      e. Stem and Disc: Bronze.
      f. Packing: Asbestos free.
      g. Handwheel: Malleable iron, bronze, or aluminum.

2.6 IRON GATE VALVES

A. Iron Gate Valves, NRS, Class 125:

B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Valve, Inc
   b. Hammond Valve.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
   e. Powell Valves.
   f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   g. Or approved equal

1. Description:
   a. Standard: MSS SP-70, Type I.
   b. CWP Rating: 200 psig.
   c. Body Material: Gray iron with bolted bonnet.
   d. Ends: Flanged.
   e. Trim: Bronze.
   f. Disc: Solid wedge.
   g. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
   1. Shutoff Service: gate valves.
   2. Throttling Service: ball, butterfly or gate valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
   1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Bronze Angle Valves: Class 125 bronze disc.
   3. Ball Valves: Two piece, full port, bronze with bronze trim.
   4. Bronze Swing Check Valves: Class 125, bronze disc.
   5. Bronze Gate Valves: Class 125, RS
   6. Bronze Globe Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger: Iron gate valves, Class 125 with flanged ends.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQ

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.3 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified NJ professional engineer, using performance requirements and design criteria indicated.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by NJ professional engineer responsible for their preparation.

1.6 QUALITY CONTROL

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing hangers and supports and providing NJ professional engineering services needed to assume engineering responsibility.

a. Engineering Responsibility for trapeze hangers: Preparation of working plans, calculations by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Stainless Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Type 316, ASTM A276

B. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psigminimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psigminimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:
1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inches thick.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 09 91 23 "Interior Painting." Section 09 96 00 "High-Performance Coatings."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
5. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
6. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
7. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.

7. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.3 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch-thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
2. Stencil Paint: Exterior, gloss, alkyd enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inchnumbers.

1. Tag Material: Brass, 0.032-inchminimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or

space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section 09960 "High Performance Coatings."

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

8. Domestic Water Piping:

    a. Background Color: Green.
    b. Letter Color: White.

9. Sanitary Waste and Vent Piping:

    a. Background Color: Black.
    b. Letter Color: White.

10. Natural Gas Piping:
    a. Background Color: Yellow.
    b. Letter Color: Black.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

    a. Cold Water: 1-1/2 inches, round.
    b. Hot Water: 1-1/2 inches, round
    c. Natural Gas Piping: 2 inches, round.

2. Valve-Tag Color:

    a. Cold Water: Green.
    b. Hot Water: Green.
    c. Natural Gas Piping: Yellow.

3. Letter Color:

a. Cold Water: White.
b. Hot Water: White.
c. Natural Gas Piping: Black.

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.3 CITED STANDARDS

A. ASTM International:
1. ASTM C534Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
2. ASTM C547Standard Specification for Mineral Fiber Pipe Insulation
3. ASTM C552Standard Specification for Cellular Glass Thermal Insulation
4. ASTM C553 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
5. ASTM C920 Standard Specification for Elastomeric Joint Sealants
6. ASTM C921 Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control reports.

1.5 QUALITY CONTROL

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Aeroflex USA, Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
d. Or approved equal.

F. Mineral-Fiber, Preformed Pipe Insulation:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.
f. Or approved equal.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Aeroflex USA, Inc.; Aeroseal.
      b. Armacell LLC; Armaflex 520 Adhesive.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
      d. K-Flex USA; R-373 Contact Adhesive.
      e. Or approved equal.

   2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
      b. Eagle Bridges - Marathon Industries; 225.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
      d. Mon-Eco Industries, Inc.; 22-25.
      e. Or approved equal.

   2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
      b. Eagle Bridges - Marathon Industries; 225.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
      d. Mon-Eco Industries, Inc.; 22-25.
      e. Or approved equal.

   2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. PVC Jacket Adhesive: Compatible with PVC jacket.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation; 739, Dow Silicone.

b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.
e. Or approved equal.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Eagle Bridges - Marathon Industries;
b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
c. Vimasco Corporation; 749.
d. Or approved equal.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mildry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.
f. Or approved equal.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 permsat 0.0625-inchdry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.4 SEALANTS

A. Joint Sealants:
   1. Joint Sealants for Cellular-Glass : Subject to compliance with requirements, provide one of the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
      b. Eagle Bridges - Marathon Industries; 405.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
      d. Mon-Eco Industries, Inc.; 44-05.
      e. Pittsburgh Corning Corporation; Pittseal 444.
      f. Or approved equal.

   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Permanently flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 100 to plus 300 deg F.
   5. Color: White or gray.
   6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
      b. Eagle Bridges - Marathon Industries;
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company;
      d. Mon-Eco Industries, Inc.;
      e. Or approved equal.

   2. Materials shall be compatible with insulation materials, jackets, and substrates.
   3. Fire- and water-resistant, flexible, elastomeric sealant.
   4. Service Temperature Range: Minus 40 to plus 250 deg F.
   5. Color: White.
   6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Johns Manville; Zeston.
   b. P.I.C. Plastics, Inc.; FG Series.
   c. Proto Corporation; LoSmoke.
   d. Speedline Corporation; SmokeSafe.
   e. Or approved equal.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
   a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. ABI, Ideal Tape Division; 428 AWF ASJ.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
   c. Compac Corporation; 104 and 105.
   d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
   e. Or approved equal.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. ABI, Ideal Tape Division; 370 White PVC tape.
   b. Compac Corporation; 130.
   c. Venture Tape; 1506 CW NS.
   d. Or approved equal.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

2.8 SECUREMENTS

A. Bands:
1. Products: Subject to compliance with requirements, provide one of the following:
a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. Johns Manville,
c. RPR Products, Inc.; Insul-Mate Strapping and Seals.
d. Or approved equal.

2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inchwide with wing seal closed seal.

2.9 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers :
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Engineered Brass Company.
b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
c. McGuire Manufacturing.
d. Plumberex.
e. Truebro; a brand of IPS Corporation.
f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
g. Or approved equal.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 incheso.c.
      a. For below-ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

F. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
   1. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
   2. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
   3. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
   4. Insulate unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
   5. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
   6. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
   7. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
   1. Install pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
   4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install mitered sections of pipe insulation.
   2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed valve covers manufactured of same material as pipe insulation when available.
   2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   3. Install insulation to flanges as specified for flange insulation application.
   4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
   3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
   1. Install preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inchoverlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.8 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Div 9 "
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Inspect pipe, fittings, strainers, and valves, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
   1. Drainage piping located in crawl spaces.
   2. Underground piping.
   3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION AND JACKETING SCHEDULE

A. Domestic Cold Water:
   1. Insulation shall be following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1.5 inch thick.
      b. PVC jacketing on exposed piping

B. Domestic Hot Water and Recirculated hot water:
   1. Insulation shall be following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1.5 inch thick.
      b. PVC jacketing on exposed piping

C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water and Stops for Plumbing Fixtures for People with Disabilities:
   1. All Pipe Sizes: Insulation shall be following:
      a. Flexible Elastomeric: 1/2 inch thick.

D. Stormwater and Overflow Drains:
   1. All Pipe Sizes: Insulation shall be following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inch thick
      b. PVC jacketing on exposed piping

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.3 SUMMARY

A. Section Includes:
   1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.4 ACTION SUBMITTALS

A. Drawings: Domestic water system drawn to scale including plans, elevations and details.

B. Product Data: For transition fittings and dielectric fittings.

1.5 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

D. Copper Unions:
1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:
1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys, 95-5 tin-antimony.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. General Requirements:
1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
b. Central Plastics Company.
c. Matco-Norca.
d. Watts; a division of Watts Water Technologies, Inc.
e. Wilkins; a Zurn company.
f. Or approved eqaul.

2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric-Flange Insulating Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.
e. Or approved equal.

2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."

F. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

H. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

I. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

K. Install piping to permit valve servicing.

L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

P. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump

Q. Install thermostats in hot-water circulation piping.

R. Install thermometers on inlet and outlet piping from each water heater.

S. Install sleeves for piping penetrations of walls, ceilings, and floors.

T. Install sleeve seals for piping penetrations of concrete walls and slabs.

U. Install escutcheons for piping penetrations of walls, ceilings, and floors.

V. JOINT CONSTRUCTION

W. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

X. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

Y. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

Z. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

AA. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

BB. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.2 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Aboveground Domestic Water Piping NPS 2and Smaller: Plastic-to-metal transition fittings or unions.

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2and Smaller: Use dielectric couplings.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:
   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 3/4and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inchrod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/4and Smaller: 84 inches with 3/8-inch rod.
   2. NPS 1-1/2: 108 inches with 3/8-inch rod.
   3. NPS 2: 10 feet with 3/8-inch rod.
   4. NPS 2-1/2: 108 inches with 1/2-inch rod.
   5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

G. Install supports for vertical steel piping every 15 feet.

H. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
   1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
   2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
   3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.6 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Piping Inspections:
      a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
   1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
   2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:
   a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
   b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
   c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
   e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
   f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 ADJUSTING

A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
   b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:
   1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
   2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill and isolate system according to either of the following:
         1) Fill system or part thereof with water/chlorine solution with at least 50 ppmof chlorine. Isolate with valves and allow to stand for 24 hours.
         2) Fill system or part thereof with water/chlorine solution with at least 200 ppmof chlorine. Isolate and allow to stand for three hours.
      c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
      d. Repeat procedures if biological examination shows contamination.
      e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.3 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Strainers.
6. Drain valves.
7. Water-hammer arresters.
8. Trap-seal primer systems.
9. Temperature-actuated, water mixing valves

B. Related Requirements:

1. Section 22 05 19 "Meters and Gages" for thermometers, pressure gages, and flow meters in domestic water piping.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers :

1. Standard: ASSE 1011.
2. Body: Bronze, non-removable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Rough bronze.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure- Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Watts LF909.
   b. Zurn Industries, LLC.
   c. Flomatic Corporation.
   d. Ames Co.
   e. Or approved equal.

2. Standard: AWWA C511-92
3. Approvals: ASSE 1013, NSF, Lead Free
4. Operation: Continuous-pressure applications.
5. Pressure Loss: 12 psig

6. Size: See Drawings
7. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved
8. End Connections: Threaded for NPS 2 and smaller
9. Configuration: Designed for horizontal, straight-through flow.
10. Accessories:

    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet. Non-Rising gate valves
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double Check Valve Detector Assembly Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Watts 709 DCDA .
    b. Zurn Industries, LLC.
    c. Ames Co.
    d. Or approved equal.

2. Standard: AWWA C510
3. Approvals: UL, FM, ASSE 1048
4. Operation: Continuous-pressure applications.
5. Pressure Loss: 10 psig
6. Size: See Drawings.
7. Body: cast iron with interior lining that complies with AWWA C550 or that is FDA approved
8. End Connections: Flanged
9. Configuration: Designed for horizontal, straight-through flow.
10. Valves: outside stem and yoke (OSY) resilient seated gate valves

2.5 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Hammond Valve.
    c. Milwaukee Valve Company.
    d. NIBCO Inc.
    e. Red-White Valve Corp.
    f. Or approved eqaul.

2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psigminimum CWP.
4. Size: NPS 2or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.

8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.6 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:

    a. Strainers: 0.020 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psigminimum CWP.
3. Size: NPS 3/4
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.8 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters HA:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. AMTROL, Inc.
    b. Precision Plumbing Products, Inc.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Tyler Pipe; Wade Div.
    f. Watts Drainage Products.
    g. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.

h. Or approved equal.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.9 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Individual-Fixture, Water Tempering Valves TMV:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Armstrong International, Inc.
   b. Honeywell Water Controls.
   c. Zurn Industries, LLC.
   d. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company
   e. Or approved equal.

2. Standard: ASSE 1016, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Body: Bronze or brass body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 110 deg F

2.10 Wall Hydrants:

A. Non-Freeze Type

1. Cast-bronze 3/4-inch hose thread outlet,
2. Self-draining,
3. Integral vacuum breaker-backflow preventer,
4. Pressure relief valve,
5. T-handle
6. Polished face, bronze wall casing,
7. Bronze operating parts
8. 3/4-inch pipe thread inlet connection.

2.11 Hose Bibbs:

A. Interior hose bibb

1. Hose thread outlet- 3/4-inch
2. Threaded female inlet flange, 3/4-inch
3. Spout outlet in-line vacuum breaker for back-siphonage protection, 3/4-inch

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to building. Comply with authorities having jurisdiction.
   1. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
   2. Do not install bypass piping around backflow preventers.

B. Install balancing valves in locations where they can easily be adjusted.

C. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve.

D. Install water-hammer arresters in water piping according to PDI-WH 201.

E. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

F. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

G. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

   1. Install cabinet-type units surface mounted on wall as specified.

3.2 FIELD QUALITY CONTROL

A. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

B. Prepare test and inspection reports.

3.3 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 221123 - DOMESTIC-WATER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and dimensions of individual components and profiles.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for booster pumps, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For booster pumps to include in emergency, operation, and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Retain protective coatings and flange's protective covers during storage.

1.6 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.

2.2 SKID MOUNTED, VARIABLE SPEED, BOOSTER PUMPS

A. Manufacturers:
   1. Bell & Gossett
   2. Grundfos Pumps Corp.
   3. SyncroFlo, Inc.
   4. Tigerflow Systems, Inc.
   5. Or approved equal.

B. Description: Factory-assembled and -tested, fluid-handling system for domestic water, with pumps, piping, valves, specialties, and controls, and mounted on base.

C. Pumps:

   1. Type: Vertical, multistage as defined in HI 1.1-1.2 and HI 1.3 for in-line, multistage, separately coupled, overhung-impeller, centrifugal pump.
   2. Casing: Cast-iron or steel base and stainless-steel chamber.
   3. Impeller: Closed, stainless steel; statically and dynamically balanced and keyed to shaft.
   4. Shaft: Stainless steel.
   5. Seal: Mechanical.
   6. Bearing: Water-lubricated sleeve type.

D. Motors: with grease-lubricated or pre-greased, permanently shielded, ball-bearings. Select motors that will not overload through full range of pump performance curve.

E. Piping: Stainless-steel pipe and fittings.

F. Valves:

   1. Shutoff Valves NPS 2 and Smaller: Gate valve or two-piece, full-port ball valve, in each pump's suction and discharge piping.

2. Shutoff Valves NPS 2-1/2 and Larger: Gate valve or lug-type butterfly valve, in each pump's suction and discharge piping and in inlet and outlet headers.
3. Check Valves NPS 2 and Smaller: Silent or swing type in each pump's discharge piping.
4. Check Valves NPS 2-1/2 and Larger: Silent type in each pump's discharge piping.
5. Thermal-Relief Valve: Temperature-and-pressure relief type in pump's discharge header piping.

G. Dielectric Fittings: With insulating material to isolate joined dissimilar metals.

H. Variable Frequency Drive (VFD): Serving each pump in pump array.

1. Manufactured Units: Pulse-width modulated; constant torque and variable torque for inverter-duty motors.
2. Output Rating: Three phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.
3. Unit Operating Requirements:

a. Internal Adjustability:

1) Minimum Speed: 5 to 25 percent of maximum rpm.
2) Maximum Speed: 80 to 100 percent of maximum rpm.
3) Acceleration: 0.1 to 999.9 seconds.
4) Deceleration: 0.1 to 999.9 seconds.
5) Current Limit: 30 to minimum of 150 percent of maximum rating.

b. Self-Protection and Reliability Features:

1) Surge suppression.
2) Loss of input signal protection.
3) Under- and overvoltage trips.
4) VFC and motor overload/overtemperature protection.
5) Critical frequency rejection.
6) Loss-of-phase protection.
7) Reverse-phase protection.
8) Motor-overtemperature fault.

c. Bidirectional autospeed search.
d. Torque boost.
e. Motor temperature compensation at slow speeds.

1) Panel-mounted operator station.
2) Historical logging information and displays.
3) Digital indicating devices.

f. Control Signal Interface: Electric.
g. Proportional Integral Derivative (PID) control interface.
h. DDC System for HVAC Protocols for Network Communications: ASHRAE 135.

4. Line Conditioning:

a. Input line conditioning.
b. Output filtering.
c. EMI/RFI filtering.

5. Bypass Systems:

a. Bypass Mode: Field-selectable automatic or manual.
b. Bypass Controller: Two-contactor style, with bypass and output isolating contactors and isolating switch.
c. Bypass Controller: Three-contactor style, with bypass and input and output isolating contactors and isolating switch.
d. Bypass Contactor Configuration: Full-voltage (across the line) type.

6. Instrumentation: Suction and discharge pressure gauges.
7. Lights: Running light for each pump.
8. Alarm Signal Device: Sounds alarm when backup pumps are operating.

a. Time Delay: Controls alarm operation; adjustable from 1 to 300 seconds, with automatic reset.

9. Thermal-bleed cutoff.
10. Low-suction-pressure cutout.
11. High-suction-pressure cutout.
12. Low-discharge-pressure cutout.
13. High-discharge-pressure cutout.
14. Direct Digital Control (DDC): Provide auxiliary contacts for interface to DDC system. DDC systems are specified in Section 230900 "Direct Digital Controls (DDC) for HVAC." Include the following points:

a. On-off status of each pump.
b. Alarm status.

I. POWER AND CONTROLS

1. Provide UL Listed, NEMA 1, Solid State, Power and Control Panel consisting of:
2. UL/C-UL 508 Label
3. Single point power connection
4. Through door control power disconnect with safety interlock to prevent door from being opened while in ON position.
5. Fused 120 V AC control voltage transformer.
6. Fused 24 V DC power supply, 1 Watt.
7. Suction and system pressure transducers
   a. All wetted parts are to be stainless steel.
   b. 4-20 mA signal with a minimum accuracy of $\pm$1%.
8. Micro Controller: PLC with non-volatile memory (battery backup not required)
9. ASHRAE 90.1 compliant technology
10. Tuning – Stepped Proportional Response
11. Operator interface: 6-inch color scale touch screen HMI (Human Machine Interface) including but not limited to the following:
    a. Main Screen with the following features:

b. Individual pump HOA (Hand – Off – Auto) switches
c. Pump run indication, including current % speed
d. Pump Failure indication
e. Current pressures readings in psig (suction and system)
f. Current flow in GPM (if flowmeter specified)
g. Adjustable manual (hand) speed setting
h. Direct access to menu screen

12. Menu screen providing direct access to all system settings and status screens
13. Pump settings screen displays current settings and allows user changes
    a. Lead and lag pump start and stop pressures, psig.
    b. Lead and lag pump ON and OFF delay times, seconds
14. Alarm settings screen displays current settings for all alarms and allows user changes.
15. Low suction alarm settings
    a. Low suction pressure, psig
    b. ON and OFF delays, seconds
    c. Manual or automatic reset
16. Low system alarm settings
    a. Low system pressure, psig
    b. ON and OFF delays, seconds
    c. Manual or automatic reset
17. High system alarm settings
    a. High system pressure, psig
    b. ON and OFF delays, seconds
    c. Manual or automatic reset
18. High suction economy mode
    a. Economy mode suction pressure, psig
    b. Economy mode enable / disable
    c. ON and OFF delays, seconds
19. Separate Alarm Silence and Alarm Reset buttons
20. Current system status screen displays:
21. Pump(s) currently running
22. Active alarms and warning messages
23. System event history screen displays a minimum of the last 10 system events, including pump start /stops, alarm conditions and alarm acknowledgements.
24. Pump run time screen displays the total operating time for each pump. Provide individual resets for each pump run time
25. Lead pump alternation options will include:
    a. Automatic alternation on lead pump shutdown.
    b. Manual alternation when operator touches alternate button
    c. Timed alternation:
        1) Daily (user specified time of day)
        2) Weekly (user specified day of week and time of day)
        3) Monthly (first week of month on user specified day of week and time of day)
26. Multi Level Security
    a. 8 Password protected security levels (field changeable passwords)
27. Common alarm relay provides dry contacts for customer monitoring.
28. Alarm horn, 85 db, annunciates all alarm conditions.

J. Base: Structural steel.

K. Hydro-pneumatic tank – ASME stamped, rated for 150 psi.

2.3 SOURCE QUALITY CONTROL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

B. ASME Compliance: Comply with ASME B31.9 for piping.

C. UL Compliance for Packaged Pumping Systems:

1. UL 508, "Industrial Control Equipment."
2. UL 508A, "Industrial Control Panels."
3. UL 778, "Motor-Operated Water Pumps."
4. UL 1995, "Heating and Cooling Equipment."

D. Booster pumps shall be listed and labeled as packaged pumping systems by testing agency acceptable to authorities having jurisdiction.

2.4 HORIZONTALLY MOUNTED, IN-LINE, CIRCULATORS

A. Description: Factory-assembled and -tested, in-line, single-stage, separately coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shafts mounted horizontal.

B. Manufacturers:
1. Bell & Gossett
2. Taco Corp.
3. Thrush Co, Inc.
4. Or approved equal.

C. Pump Construction:

1. Casing:

a. Radially split bronze, cast iron or stainless steel with threaded companion-flange connections for pumps with NPS 2 pipe connections and flanged connections for pumps with NPS 2-1/2 pipe connections.
b. Built to permit servicing of pump internals without disturbing the casing or the suction and discharge piping.
c. Gauge port tappings at suction and discharge nozzles.

2. Impeller: Bronze or stainless steel, statically and dynamically balanced, closed, and keyed to shaft.
3. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve.
4. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.

5. Seal: Mechanical, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket.
6. Bearings: Grease-lubricated or permanently lubricated ball type.
7. Minimum Working Pressure: 125 psig .
8. Continuous Operating Temperature: 200 deg F.

D. Motor: Single speed or multispeed, with permanently lubricated ball bearings; and resiliently or rigidly mounted to pump casing.

E. Controls
1. Thermostats: Electric; adjustable for control of hot-water circulation pump.
2. Type: Water-immersion temperature sensor, for installation in piping.
3. Range: 65 to 200 deg F.
4. Enclosure: NEMA 250.
5. Operation of Pump: On or off.
6. Transformer: Provide if required.
7. Power Requirement: 120 V ac.
8. Settings: Start pump at 105 deg F and stop pump at 125 deg F .

2.5 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in NFPA 70.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for booster pumps to verify actual locations of piping connections before booster-pump installation.

3.2 INSTALLATION

A. Support connected domestic-water piping, so weight of piping is not supported by booster pumps.

B. Install thermostats in hot-water return piping.

C. Install timers on wall in engineer's office.

D. Install time-delay relays in piping between water heaters and hot-water storage tanks.

E. In-line Pump Mounting:
   1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
   2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
   3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   4. Install anchor bolts to elevations required for proper attachment to supported equipment.

F. Install continuous-thread hanger rods and vibration isolation of size required to support pump weight.
   1. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

G. Install thermostats in hot-water return piping.

3.3 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Booster-Pump Piping Connections: Connect domestic-water piping to booster pumps. Install suction and discharge pipe equal to or greater than size of system suction and discharge piping.

   1. Install shutoff valves on piping connections to booster-pump suction and discharge headers. Install ball, butterfly, or gate valves same size as suction and discharge headers. Comply with requirements for general-duty valves specified in Section 220523 "General Duty Valves for Plumbing."
   2. Install union, flanged, or grooved-joint connections on suction and discharge headers at connection to domestic-water piping. Comply with requirements for unions and flanges specified in Section 221116 "Domestic Water Piping."
   3. Install valved bypass, same size as and between piping, at connections to booster-pump suction and discharge headers. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
   4. Install flexible connectors, same size as piping, on piping connections to booster-pump suction and discharge headers. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."
   5. Where installing piping adjacent to booster pumps, allow space for service and maintenance.

C. Connect domestic-water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.

   1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:

      a. Horizontally mounted, in-line, separately coupled centrifugal pumps.
      b. Horizontally mounted, in-line, close-coupled centrifugal pumps.
      c. Vertically mounted, in-line, close-coupled centrifugal pumps.

d. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."

D. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties." Comply with requirements for valves specified in the following:

1. Section 220523 "General Duty Valves."
2. Install pressure gauge and snubber at suction of each pump and pressure gauge and snubber at discharge of each pump. Install at integral pressure-gauge tappings where provided or install pressure-gauge connectors in suction and discharge piping around pumps. Comply with requirements for pressure gauges and snubbers specified in Section 220519 "Meters and Gages for Plumbing Piping."

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Section 260519 "Low Voltage Electrical Power Conductors and Cables."

3.6 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a factory-authorized service representative.

1. Perform visual and mechanical inspection.
2. Leak Test: After installation, charge booster pump and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start booster pumps to confirm proper motor rotation and booster-pump operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Pumps and controls will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 ADJUSTING

A. Adjust booster pumps to function smoothly and lubricate as recommended by manufacturer.

B. Adjust pressure set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting booster pump to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

D. Adjust inline, domestic-water pumps to function smoothly, and lubricate as recommended by manufacturer.

E. Adjust initial temperature set points.

F. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.9 Training

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain booster pumps.

END OF SECTION 221123

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.02 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.03 SECTION INCLUDES

A. This section includes furnishing and installing sanitary waste and vent pipe, fittings, accessories, specialties as shown, specified, or required for a complete installation and satisfactory operation. Provide pipe and fittings of new materials, protected from dirt, moisture and mechanical damage.

1.04 SUBMITTALS

A. General: Provide submittals, including the following, in conformity with Div 1.

B. Product Data and Information: Provide data on pipe materials, pipe fittings, and accessories.

C. Shop Drawings: Provide shop drawings showing the following:
   1. Layout of pipes, drawn to scale, with fittings, supports, and equipment.
   2. Sections showing elevations of pipes, fittings, supports, valves and equipment.
   3. Pipe size, type, material, and schedule.

1.05 QUALITY CONTROL AND QUALIFICATIONS

A. The work shall be done by a certified plumbing contractor as defined by the state of NJ.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle all products and materials as specified in Division 1 and as follows:
   1. Provide temporary end caps and closures on piping and fittings. Maintain end caps in place until installation.

2. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are acceptable. Equivalent products of other manufacturers may be submitted for approval.

B. Cast Iron - Pipe and Fittings
1. Charlotte Pipe and Foundry Company
2. Penn Products
3. Tyler Pipe Company
4. Or approved equal

2.2 CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe, Tubing and Fittings:
1. Pipe and Fittings: Buried soil pipe and fittings shall be cast iron, service weight, hub and spigot meeting the requirements of ASTM A74. Above ground soil pipe shall be hubless cast iron pipe and fittings meeting the requirements of CISPI 301. Hubless pipe and fittings shall not be used for buried pipe. Refer to pipe schedules on the Contract Drawings.
   a. Protective Coatings: Interior protective coatings (linings) and exterior protective coatings for pipe and fittings in the finished work shall be as follows and as indicated in the piping schedules.
2. Interior bituminous lining shall be in accordance with AWWA C151.
3. Pipe and fittings not exposed in the finished work, or if the pipe schedules indicate that the pipe exterior is to have a bituminous coating, the pipe shall be coated in accordance with the requirements of AWWA C151.
4. Piping shall be painted in accordance with the requirements in the Div. 9 Painting Specification.
5. Joints: Neoprene gasket, compression type joints shall be in accordance with ASTM C564 for hub and spigot pipe. Hubless couplings for hubless pipe, shall be composed of a stainless-steel shield, clamp assembly and an elastomeric sealing sleeve conforming to CISPI 310.

2.3 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

3. Unshielded, Non-pressure Transition Couplings:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Dallas Specialty & Mfg. Co.
      2) Fernco Inc.
      3) Mission Rubber Company; a division of MCP Industries, Inc.
      4) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
      5) Or approved equal.

   b. Standard: ASTM C 1173.
   c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
   d. Sleeve Materials:

      1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
      2) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Non-pressure Transition Couplings:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Cascade Waterworks Mfg. Co.
      2) Mission Rubber Company; a division of MCP Industries, Inc.
      3) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
      4) Or approved equal.

   b. Standard: ASTM C 1460.
   c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 1- EXECUTION

1.01 INSTALLATION

A. Piping Installation: Install plumbing piping clear of all building elements.
   1. Pitch drain-line piping uniformly downward in the direction of flow not less than 1/8-inch per lineal foot.
   2. Review elevations before proceeding with the Work, and the location, depth and size of sewers before connections are made.
   3. Before running any drains and sewers within buildings, or any vent or drain stacks, or any water lines, verify that they can be run without trapping, sagging or interfering with columns, beams, piping, fixtures, ducts, or other system components. Coordinate necessary changes before pipes are installed.

4. Flash pipes passing through the roof watertight with 4-pound per square foot sheet lead, except as otherwise shown. Extend flashing out on the roof not less than 18 inches from the pipe or edge of drain in all directions and turn down into vent pipes.

B. Cleanouts: Provide cleanouts at ends of mains, each change in direction of more than 45 degrees, spaced not more than 50 feet apart in all straight runs, and at the base of all soil stacks, downspouts, and fixture traps. Terminate cleanouts for concealed pipes flush with finish floor, wall or grade with trim as specified. Provide cleanouts of the same size as the pipe up to 4 inches in diameter, and 4-inch size for larger pipes and located for convenient access.

C. Pipe Sleeves: Provide steel pipe sleeves for pipes piercing concrete and masonry construction. Install pipe sleeves with welded water stop plates in floors, exterior walls and foundation walls.
1. Seal watertight insulated and uninsulated lines installed in the pipe sleeves with an elastic mechanical pipe sleeve seal of size and service designation as recommended by the manufacturer for proper sealing.
2. Furnish appropriate fire-rated sleeve seal and insulated pipe protectors for fired rated walls and floors.

D. Pipe Identification: Identify all pipelines in accordance with Specification 220553.

E. Hangers and Supports: Provide hangers and supports as specified in Specification 220529.

3.02 INSPECTION AND TESTING

A. All pipelines shall remain undisturbed for 24 hours to develop complete strength at all joints. All pipelines shall be subjected to a hydrostatic pressure test for 2 hours at full working pressure. All leaks shall be repaired, and lines retested as approved by the Engineer. Prior to testing, the pipelines shall be supported in an approved manner to prevent movement during tests.

B. The test pressures and temperatures for the various pipe lines shall be as follows. Pipe shall be pressure tested with water. Pressure testing with air or gas is not permitted.
1. Drain piping: 10 ft of head
2. Vent piping: 10 ft of head

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.3 SUMMARY

A. Section Includes:
1. Cleanouts.
2. Floor drains.
3. Miscellaneous sanitary drainage piping specialties.
4. Flashing materials.

1.4 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene plastic.

D. PE: Polyethylene plastic.

E. PP: PVC: Polyvinyl chloride plastic.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY CONTROL

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.8 COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Metal Floor Cleanouts:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      b. Tyler Pipe; Wade Div.
      c. Watts Drainage Products Inc.
      d. Zurn Plumbing Products Group; Specification Drainage Operation.
      e. Or approved equal.

   2. Standard: ASME A112.36.2M cast iron for cleanout test tee.
   3. Size: Same as connected drainage piping
   4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
   5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
   6. Closure: Stainless-steel plug with seal.

B. Outdoor Cleanouts :
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Sioux Chief Manufacturing Company, Inc.
      b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      c. Tyler Pipe; Wade Div.
      d. Watts Drainage Products Inc.
      e. Zurn Plumbing Products Group; Specification Drainage Operation.
      f. Or approved equal.

   2. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
   3. Size: Same as connected branch.
   4. Type: Heavy-duty, adjustable housing.
   5. Body or Ferrule: Cast iron or Stainless steel.
   6. Clamping Device: Required.
   7. Outlet Connection: Threaded.

8. Closure: Brass plug with tapered threads.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Rough bronze.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts :
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Smith, Jay R. Mfg. Co.; d of Smith Industries, Inc.
b. Tyler Pipe; Wade Div.
c. Watts Drainage Products Inc.
d. Zurn Plumbing Products Group; Specification Drainage Operation.
e. Or approved equal.

2. Standard: ASME A112.36.2M. Include stainless steel or nickel bronze wall access cover.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-headplug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains FD:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
b. Tyler Pipe; Wade Div.
c. Watts Drainage Products Inc.
d. Zurn Plumbing Products Group; Specification Drainage Operation.
e. Or approved equal

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom.
9. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel
10. Sediment Bucket: Not required.
11. Top or Strainer Material: Gray iron.
12. Top of Body and Strainer Finish: Rough bronze.
13. Top Shape: Round.
14. Dimensions of Top or Strainer: see schedule.
15. Top Loading Classification: Heavy Duty.

16. Funnel: Required in sumps for hand wash sinks.
17. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
18. Trap Features: Trap-seal primer valve drain connection.

2.3 Trench Drains

A. Trench Drains

1. Provide pre-engineered concrete forming trench drains using expanded polystyrene forms, structural steel rails, no float legs, end frames, grate locking device, and outlet connection.
2. Grate – extra heavy duty slotted ductile iron. Load class E (AASHTO rated H-20).
3. Trench drains shall be JR Smith, ABT, Inc., Zurn Corp or approved equal.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. NPS 2: 4-inch-minimum water seal.
    b. NPS 2-1/2and Larger: 5-inch-minimum water seal.

B. Floor-Drain, Trap-Seal Primer Fittings :

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2side inlet.

C. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

D. Sleeve Flashing Device :

1. Description: Manufactured, cast-iron fitting, with clamping device that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

E. Stack Flashing Fittings :

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

F. Vent Caps :

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Expansion Joints :

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

2.5 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz. /sq. ft.
2. Vent Pipe Flashing: 8 oz. /sq. ft.

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inchminimum thickness, unless otherwise indicated. Include G90hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-milminimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inchtotal depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inchtotal depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install air-admittance-valve wall boxes recessed in wall.

G. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

H. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

I. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

J. Assemble open drain fittings and install with top of hub 2 inches above floor.

K. Install deep-seal traps on floor drains and other waste outlets, if indicated.

L. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

M. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

N. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

O. Install vent caps on each vent pipe passing through roof.

P. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

Q. Install wood-blocking reinforcement for wall-mounting-type specialties.

R. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
1. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counter flashing or commercially made flashing fittings, according to Section 07 62 00 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 221413 - STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Galvanized-steel pipe and fittings.

B. Related Requirements:

1. Section 220529 "Hangers and Supports for Piping and Equipment”

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans and details.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Detail storm drainage piping. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which drainage piping will be attached or suspended from.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water
2. Storm Drainage, Force-Main Piping: 50 psig.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Charlotte Pipe, Tyler Pipe, Penn Products or approved equal.

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Class: ASTM A 74, Service class.

C. Gaskets: ASTM C 564, rubber.

D. Caulking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Charlotte Pipe, Tyler Pipe, Penn Products or approved equal.

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standard: ASTM A 888 or CISPI 301.

C. CISPI, Hubless-Piping Couplings:
1. Couplings shall bear CISPI collective trademark and NSF certification mark.
2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:
1. Standard: ASTM C 1540.
2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

E. Cast-Iron, Hubless-Piping Couplings:
1. Standard: ASTM C 1277.
2. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 CLEANOUTS

A. Metal Floor Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   b. Tyler Pipe; Wade Div.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.
   e. Or approved equal.

2. Standard: ASME A112.36.2M cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
6. Closure: Stainless-steel plug with seal.

B. Outdoor Cleanouts :
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Sioux Chief Manufacturing Company, Inc.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Tyler Pipe; Wade Div.
   d. Watts Drainage Products Inc.
   e. Zurn Plumbing Products Group; Specification Drainage Operation.
   f. Or approved equal.

2. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Heavy-duty, adjustable housing.
5. Body or Ferrule: Cast iron or Stainless steel.
6. Clamping Device: Required.
7. Outlet Connection: Threaded.
8. Closure: Brass plug with tapered threads.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Rough bronze.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts :
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Smith, Jay R. Mfg. Co.; d of Smith Industries, Inc.
   b. Tyler Pipe; Wade Div.
   c. Watts Drainage Products Inc.
   d. Zurn Plumbing Products Group; Specification Drainage Operation.
   e. Or approved equal.

2. Standard: ASME A112.36.2M. Include stainless steel or nickel bronze wall access cover.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-headplug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round wall-installation frame and cover.

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Non-pressure Transition Couplings:
   a. Standard: ASTM C 1173.
   b. Description: Elastomeric sleeve, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
   c. Sleeve Materials:

      1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
      2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
      3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.

1. Do not change direction of flow more than 90 degrees.
2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

L. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

M. Install steel piping according to applicable plumbing code.

N. Install engineered siphonic drain specialties and storm drainage piping in locations indicated.

O. Install force mains at elevations indicated.

P. Plumbing Specialties:

1. Install cleanouts at base of leaders.

Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

R. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Caulked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum caulked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1.

1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
c. Do not use pipe sections that have cracked or open welds.

E. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fittings. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

3.3 SPECIALTY PIPE FITTING INSTALLATION

3.4 VALVE INSTALLATION

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.

3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
6. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install hangers for cast-iron soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

D. Support vertical cast-iron piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent, but as a minimum at base and at each floor.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Comply with requirements for cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."

D. Connect force-main piping to the following:

1. Storm Sewer: To exterior force main.
2. Sump Pumps: To sump pump discharge.

E. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.7 IDENTIFICATION

A. Identify exposed storm drainage piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Test Procedure:

    a. Test storm drainage piping on completion of roughing-in.
    b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

C. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.

    a. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

4. Prepare reports for tests and required corrective action.

D. Piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping shall be the following:
1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

C. Underground storm drainage piping shall be the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 221429 - SUMP PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Submersible sump pumps.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with manufacturer's written instructions for handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

2.2 SUBMERSIBLE SUMP PUMPS

A. Submersible, Fixed-Position, Single-Seal Sump Pumps:
   1. Description: Factory-assembled and -tested sump-pump unit.
   2. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sump pump as defined in HI 1.1-1.2 and HI 1.3.
   3. Pump Casing: Cast iron, with strainer inlet, legs that elevate pump to permit flow into impeller, and vertical discharge for piping connection.
   4. Impeller: Statically and dynamically balanced, ASTM A48/A48M, Class No. 25 A cast iron design for clear wastewater handling, and keyed and secured to shaft.
   5. Pump and Motor Shaft: steel with factory-sealed, grease-lubricated ball bearings.
   6. Seal: Mechanical.
   7. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.

      a. Motor Housing Fluid: Air.

   8. Controls:

      a. Enclosure: NEMA 250.
      b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
      c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
      d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
      e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120 V ac, with transformer and contacts for remote alarm bell.

   9. Controls:

      a. Enclosure: NEMA 250, wall mounted.
      b. Switch Type: Mechanical-float type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.
      c. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float switch matching control and electric bell; 120 V ac, with transformer and contacts for remote alarm bell.
      d. Include shut off for oil detection.

10. Control-Interface Features:

    a. Remote Alarm Contacts: For remote alarm interface.
    b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:

        1) On-off status of pump.
        2) Alarm status.

B. Acceptable Manufacturers:
1. Liberty Pump
2. Little Giant Pumps
3. Sulzer Inc.
4. Or approved equal.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Motors for submersible pumps shall be hermetically sealed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for plumbing piping to verify actual locations of storm drainage piping connections before sump pump installation.

3.2 INSTALLATION

A. Pump Installation Standards: Comply with HI 1.4 for installation of sump pumps.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test, inspect, and adjust components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections:

1. Perform each visual and mechanical inspection.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Pumps and controls will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup check according to manufacturer's written instructions.

3.6 ADJUSTING

A. Adjust pumps to function smoothly and lubricate as recommended by manufacturer.

B. Adjust control set points.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain controls and pumps.

END OF SECTION 221429

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 223300 - DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Commercial, electric, storage, domestic-water heaters.
   2. Domestic-water heater accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

   1. Wiring Diagrams: For power, signal, and control wiring.

PART 2 - PRODUCTS

2.1 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

A. Commercial, Electric, Storage, Domestic-Water Heaters:

   1. Standard: UL 1453.
   2. Storage-Tank Construction: steel vertical arrangement.

      a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.

         1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.

      b. Pressure Rating: 150 psig.
      c. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.

   3. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
c. Insulation: Comply with ASHRAE/IESNA 90.1.
d. Jacket: Steel with enameled finish.
e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
f. Temperature Control: Adjustable thermostat.
g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
h. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

4. Special Requirements: NSF 5 construction.

2.2 INSTANTANEOUS WATER HEATER

A. Thermostat-Control, Electric, Tankless, Domestic-Water Heaters:
1. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
2. Construction: Copper piping or tubing complying with NSF 61 Annex G barrier materials for potable water, without storage capacity.
a. Connections: ASME B1.20.1 pipe thread.
b. Pressure Rating: 150 psig .
c. Heating Element: Resistance heating system.
d. Temperature Control: Thermostat.
e. Safety Control: High-temperature-limit cutoff device or system.
f. Cover: ABS-UL-94VO rated.
3. Support: Bracket for wall mounting.

2.3 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
2. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

3. Capacity and Characteristics:

a. Working-Pressure Rating: 150 psig.
b. Capacity Acceptable: 10 gal. minimum.

B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.

C. Heat-Trap Fittings: ASHRAE 90.2.

D. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

E. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.

F. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

G. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.

H. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Install electric, domestic-water heaters on floor.

1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Anchor domestic-water heaters to substrate.

B. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping.

C. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains.

E. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages."

F. Install thermometers on inlet and outlet piping of residential, solar, electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages."

G. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.

H. Fill electric, domestic-water heaters with water.

I. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements".

C. Prepare test and inspection reports.

END OF SECTION 223300

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partrial release
plumbing
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 224218 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 - General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.01 SECTION INCLUDES

A. The contractor shall furnish, install, test and place in satisfactory operation all plumbing fixtures as specified herein, and as shown on the Contract Drawings.

B. Plumbing fixtures shall be furnished complete with all accessories, attachments, fastenings and other appurtenances as specified or as may be required for a satisfactory installation.

1.02 REFERENCES

A. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

B. ASME A112.18.1M - Plumbing Fixture Fittings.

C. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures.

D. ASME A112.19.2M - Vitreous China Plumbing Fixtures.

E. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals (Dimensional Standards).

F. ANSI Z358.1 - Emergency Eyewash and Shower Equipment.

G. ANSI/ARI 1010 - Drinking-Fountains and Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers.

H. ANSI/CABO A117.1 - Accessible and Usable Buildings and Facilities.

I. U.S. Department of Commerce Commercial Standard.

J. National Standard Plumbing Code

1.03 DESIGN REQUIREMENTS

A. Plumbing fixtures shall be of the water conservation type and shall conform to the requirements of the local Code.

B. Contract Drawings are generally diagrammatic and installation of the plumbing fixtures in the allotted spaces shall be verified.

1.04 SUBMITTALS

A. The contractor shall submit shop drawings and material specifications for the approval of the Engineer.

B. Manufacturer’s technical information which shall include:
1. Product Data and Information: Provide catalogue cuts of all plumbing fixtures, sizes, rough-in dimensions, utility sizes, faucets, drains, carriers, flush valves, trim and finishes, and all electrical requirements. Complete assembly, layout required clearances and installation drawings with clearly marked dimensions. Provide a list of manufacturer's recommended special tools and spare parts to be supplied.
2. Operation and Maintenance Manuals: Submit operation and maintenance manuals in accordance with Div 1 for plumbing fixtures, faucets, drains, mixing valves, flush valves, carriers, assembly of parts list for flush valves, signage, emergency equipment and electric water coolers as required.

1.05 QUALITY CONTROL AND QUALIFICATIONS

A. The contractor shall be a licensed plumber.

B. All plumbing fixtures shall be "First Quality" as defined and set forth in Commercial Standard CS77-28 as promulgated by the U.S. Department of Commerce. All fixtures are to be white vitreous china unless otherwise specifically noted. Where enameled iron fixtures are specified, they shall be furnished with acid resisting enamel.

C. Plumbing fixtures shall essentially be as efficient as those fixtures that have been tested to perform satisfactorily for at least two years.

D. Fixtures shall be properly protected from damage during construction and shall be cleaned in accordance with manufacturer's instructions.

E. Fixtures and fittings proposed shall be from one manufacturer and of similar character in any room or location. Escutcheons, handles, etc., on the different fixtures shall be of the same design.

F. All plumbing fixtures and other related materials shall be inspected for chips, cracks, dents and other flaws. Only items free from defects shall be installed in the work. All fixtures shall be furnished with all necessary supports, hangers, brackets, etc., for the proper installation of the fixtures. Such supports, etc., shall be in accordance with the manufacturer's recommendations.

G. All wall hung fixtures shall be adequately supported from floor with fixture support carriers independent from walls, and floor mounted fixtures shall be secured to concrete slabs with lead expansion inserts.

1.06 DELIVERY, STORAGE AND HANDLING

A. The contractor shall deliver the plumbing fixtures and appurtenances to the site in the original sealed packing crate. All products shall be protected from chips, scratches or any damage. Any product damaged shall be replaced at no additional cost to the owner. The fixtures will be inspected for damages. Fixtures gouged, chipped or otherwise damaged will not be considered acceptable.

B. The contractor shall be responsible for securing storage until final acceptance. The owner will not be responsible for any products lost or stolen. Plumbing fixtures shall be stored on heavy wood blocking or platforms so that they are not in contact with the ground.

C. To avoid unnecessary handling, plumbing fixtures shall be unloaded as close to the place where they are to be installed as is practical. Interiors shall be kept free from dirt and foreign matter.

1.07 JOB CONDITIONS

A. Protection: At the end of each days Work or other stopping point throughout the construction, contractor shall provide temporary covering over all plumbing fixtures and trim as required to prevent damage due to moisture, dirt, plaster, concrete or other material. Chipped, cracked, dented or damaged fixtures or trim will not be accepted in the finished installation.

1.08 FIELD MEASUREMENTS

A. The contractor shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of the work.

B. The contractor shall review the Contract Drawings and any discrepancies shall be reported to the Engineer for clarification prior to starting installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. All plumbing fixtures provided shall be of high quality and shall be manufactured from the following materials:
   1. Vitreous china shall be non-absorbent, hard-burned, and vitrified throughout the body.
   2. Porcelain enameled ware shall have specially selected, clear white, acid-resisting enamel coating evenly applied on surfaces.
   3. Internal parts of flush and/or flushometer valves, may contain acetal resin, fluorocarbon, nylon, acrylonitrile-butadiene-styrene (ABS) or other plastic material, if the material has provided satisfactory service under actual commercial or industrial operating conditions for not less than 2 years. Plastic in contact with hot water shall be suitable for 180 degrees Fahrenheit water temperature.
   4. No fixture will be accepted that shows cracks, blisters, thin spots, or other flaws. All fixtures shall be white and faucets shall have chrome plated flexible tube risers with loose key operated shutoff valves.

B. Fixtures shall be equipped with appurtenances such as traps, faucets, stop valves, and drain fittings. Each fixture and piece of equipment requiring connections to the drainage system shall be equipped with a trap. All exposed traps shall be cast brass swivel chromium plated, grounded joint, and with cleanout.

C. Brass expansion or toggle bolts capped with acorn nuts shall be provided for supports, and polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view.

D. Plumbing fixtures shall be as indicated in the Plumbing Fixture Schedule on the Contract Drawings.

2.02 FIXTURES

A. Water Closets:
   1. Item No. WC:
      a. Manufacturer: American Standard, Kohler, Zurn or approved equal.
      b. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
      c. Type: wall mounted
      d. Water Consumption: 1.28 gal. per flush.

      e. Features:
         1) Elongated bowl.
         2) Flush Valve – sensor operated
         3) ADA Compliant
      f. Materials: Vitreous China, white.
      g. Carrier Support:

         1) Standard: ASME A112.6.1M.

         2) Description: Extra Heavy-duty (750lb.) waste-fitting assembly as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching

fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

3) Mounting Height: Handicapped according to ICC/ANSI A117.1.

h. Sensor Operated Flushometer Valves:

1) Standard: ASSE 1037.

2) Minimum Pressure Rating: 125 psig

3) Features: Include integral check stop and backflow-prevention device.

4) Material: Brass body with corrosion-resistant components.

5) Exposed Flushometer-Valve Finish: Chrome plated.

6) Minimum Inlet: NPS 1.

7) Minimum Outlet: NPS 1-1/4.

i. Accessories:

1) Seat, white open front

B. Lavatories:

1. Item No. LAV:

a. Vitreous china, under counter mounted.

b. Manufacturers: provide products by the following:

1) American Standard America.

2) Kohler Co.

3) Zurn Industries, LLC

4) Or approved equal

c. Fixture:

1) Standard: ASME A112.19.2/CSA B45.1.

2) Nominal Size: Oval, 19” x 16” x 5”

3) Color: White

4) Rear overflow.

d. Faucet: Solid-Brass, Sensor Operated, 0.5 gpm aerator.

1) Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a) Chicago Faucets.

b) Kohler Co.

c) Delta Faucet Company

d) Just Manufacturing

e) Zurn Industries, LLC; Commercial Brass and Fixtures

f) Or approved equal

2) Standard: ASME A112.18.1/CSA B125.1.

3) General: coordinate faucet inlets with supplies and fixture hole punching; coordinate outlet with spout and fixture receptor.

4) Body type in "Body Type" Subparagraph below must match fixture hole punching.

5) Body Type: Centerset

6) Body Material: Commercial, solid brass.

7) Finish: Polished chrome plate.

8) Flow Rate: 0.5 gpm.

9) Mounting Type: Deck, exposed.

10) Spout: Rigid.

11) Spout Outlet: Aerator.

12) Drain: Not part of faucet.

e. Accessories:

1) Chrome plated brass P-trap with clean-out plug and arm with escutcheon.

2) Grid strainer

3) ADA trap, stop and supply protectors or knee contact.

C. Urinal (UR):
1. Manufacturer: American Standard, Kohler, Zurn or approved equal.
2. Fixture: Vitreous china, siphon jet action, top spud, flushing rim.
3. Trim: sensor operated flush valve, 0.5 gallons per flush.
4. Carrier: heavy duty, commercial type.

D. Service Sink:

1. Manufacturers: provide products by the following:
   a. American Standard America.
   b. Kohler Co.
   c. Zurn Industries, LLC
   d. Or approved equal

2. Fixture:
   a. Material: enameled cast iron
   b. With wall hanger plate, U type stainless steel rim guard, 9” backsplash, strainer and 3” cast iron P trap.

c. Dimensions: 24” x 20” x 10” D.

3. Faucet: Wall mounted, exposed. Chrome plated service faucet with vacuum breaker, integral stops, wall brace, pail and hook, four-arm hot and cold handles and ¾” hose thread on spout according to ASME B1.20.7.

E. Water Coolers EWC: Dual, Wall mounted, with bottle fill station.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Elkay Manufacturing Co.
b. Halsey Taylor.
c. Haws Corporation
d. Or approved eqaul.

4. Standards:

a. Comply with NSF 61.
b. Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.

5. Basin: Stainless steel.
6. Bubbler: Polished chrome-plated brass with laminar flow and vandal resistance.
7. Control: Push button.
8. Drain: Grid with NPS 1-1/4 tailpiece.
9. Supply: NPS 3/8with shutoff valve.
10. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 brass P-trap.
11. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards, with capacity sized for unit peak flow rate.
12. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

13. Capacities and Characteristics:

a. Cooled Water: 8 gph.
b. Ambient-Air Temperature: 90 deg F.
c. Inlet-Water Temperature: 80 deg F.
d. Cooled-Water Temperature: 50 deg F.
e. Electrical Characteristics:

1) Motor Horsepower: 1/6.
2) Volts: 115V.

3) Phase: Single.
4) Hertz: 60.
5) Amps: 5A.

14. Support: Heavy duty galvanized steel mounting frame.

F. Pantry Sink:
1. Item No. S:
a. Manufacturer: American Standard, Elkay, Kohler, or approved equal
b. Sink Nominal Dimensions – 31” x 18-1/2” x 8”
c. Style - double bowl,
d. Installation – undermount
e. Material – 18 gauge, 304 stainless steel
f. Drain – rear center
g. Accessories – sound guard

2. Faucet
a. Manual, single lever, hot and cold water mixing faucet
b. 10” brass swing spout
c. Flow rate - 1.5 gpm
d. 4-5/8” lever handle
e. Finish – chrome plate
f. Type – pressure compensating aerator
g. Basis of design – Chicago Faucets model No. 2300-E34ABCP, Delta Faucet Co., Kohler or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Fixtures requiring hot and cold water shall have the cold-water faucet on the right hand side of the fixture and the hot water faucet on the left hand side of the fixture. Each fixture shall have shut off valves or stops for hot and cold water.

B. Each fixture shall be separately trapped.

C. Pipe openings shall be closed with caps or plugs during installation. Fixtures shall be tightly covered and protected against dirt, water, chemicals and mechanical injury.

D. Plated or polished fittings, pipes and appliances shall be coated with protective material immediately after installation.

E. Where space limitations prohibit fixture connections with standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made gas-tight and water-tight with a

closet-setting compound or neoprene gasket and seal. Use of natural rubber gaskets or putty will not be permitted. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

F. Confirm location, size of fixtures and openings before installation.

G. Layout fixtures as indicated on the drawings.

H. Carefully install fixtures in accordance with manufacturer's data with sufficient clearances to coordinate with accessories, specialties and equipment specified in other divisions of these specifications and/or as shown on the drawings.

I. Hangers and carriers shall be installed in accordance with manufacturer's recommendations and in accordance with good practice and workmanship.

J. Provide one support for each water closet with all necessary hardware and gaskets, suitable for specified floor construction.

K. Upon completion of the work, all labels shall be removed, fixtures and trim shall be cleaned of all dirt, grease and markings and all valves properly adjusted.

L. Clean all exposed metal surfaces from grease, dirt, paint or other foreign material.

M. Fixtures shall be properly protected from damage during construction and shall be cleaned in accordance with manufacturer's instructions.

N. Fixtures, chrome-plated piping, fittings and trim shall be polished before requesting acceptance of the system.

O. All exposed valves and trim shall be chrome plated.

P. The entire plumbing installation shall be in accordance with best standard practice and in conformance with the plumbing ordinances in the local Building Code.

Q. Lavatory faucets for handicapped and non-handicapped utilization shall match.

R. Insulate drain, trap, hot and cold water supply lines under handicapped lavatories.

S. Safety Equipment:
   1. System Shutoff Valves:
      a. Shutoff valves shall give visual indication of position (open or closed).
      b. Shutoff valves shall be lockable valves and locked in open position.

   2. Each safety shower, eyewash, combination safety shower/eyewash shall have red safety signoff tag. After completing requirements listed below, Contractor and Commission shall sign red safety signoff tag. Requirements are as follows:
      a. Visually check safety shower/eyewash piping for leaks.
      b. Verify that upon operation, stay-open valves remain open.

c. Showerheads to be between 82 inches and 96 inches above standing surface.
d. Shower spray pattern, when valve is full open, shall be a minimum 20 inches in diameter at 60 inches above standing surface.
e. Water arcs from eyewash spray heads must cross. Test with eyewash gauge; Haws Drinking Faucet Co., Model 9015.
f. Minimum flow rates for safety showers shall be 20 gpm.
g. Minimum flow rates for eyewashes shall be 3 gpm.
h. Tempered water shall be temperature indicated on Drawings.

3.02 FIXTURE HEIGHTS

A. The contractor shall install fixtures to the heights above finished floor as indicated on the Architectural drawings, as per ADA requirements. Installation of fixtures for use by the physically handicapped shall be in accordance with ANSI/CABO A117.1.

B. Water Closet Flush Valves:
1. Standard 11 inches minimum above bowl rim.
2. Handicapped 27 inches from finished floor.

C. Urinal Flush Valve:
1. Standard 22 inches to top of bowl rim.
2. Handicapped 44 inches from finished floor.

3.03 ADJUSTING

A. Upon completion of the installation, the contractor shall adjust all fixtures for their intended use.

B. The contractor shall operate each fixture to ensure their performance without splashing, noise or overflow.

3.04 CLEANING

A. The contractor shall thoroughly clean all surfaces of the installed fixtures and polish all chromed surfaces.

B. Fixtures shall be protected and use of fixtures will not be permitted until permission is given by the Engineer.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished Work as specified in Division 1.

B. Fixture Use: Do not permit use of fixtures prior to being accepted by the owner.

3.06 SUPPORT TESTING

A. All wall hung fixtures shall have a sand bag load placed on the fixture in accordance with the testing schedule below and shall not exhibit any downward deflection.

Testing Schedule	
Fixture	Load
Water Closet	250 lbs
Lavatory	150 lbs
Service Sink Faucet	50 lbs
Urinal	150 lbs
Electric Water Cooler	50 lbs

3.07 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop drawings. Confirm the location and size of fixtures and openings before rough-in and installation.

END OF SECTION

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMEN

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

B. Motors, up to 200 Hp, furnished under other Sections, shall be in conformance with the requirements listed in this Section unless otherwise noted.

C. Motors connected to Variable Frequency Drive Controllers shall be inverter duty rated.

D. All motor overloads shall be coordinated with its associated motor starter and/or VFD.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

1.4 SUBMITTALS

A. Submittal of motor data for acceptance shall include complete nameplate data per NEMA Standard MG1-10.39 and MG1-10.40 and test characteristics in accordance with NEMA Standard MG1-12.55 "Routine Tests for Polyphase Medium Induction Motors" and, in addition, the following for motors typical of the units furnished:

1. Efficiency at 1/2, 3/4 and full load

2. Power factor at 1/2, 3/4 and full load

3. Motor outline, dimensions and weight

4. Descriptive bulletins, including full description of insulation system

5. Bearing design data

6. Special features (i.e., space heaters, temperature detectors, etc.)

7. Power factor correction capacitor rating and type.

8. Locked rotor current

9. Brake horsepower

10. An outline drawing or an outline data sheet showing complete motor dimensions shall be submitted to cover every motor rated greater than 1/3 horsepower. Several motors of the same type and rating for the same application may be covered by a single drawing or outline sheet. Drawings or sheets shall bear complete identifying data including frame size, speed, horsepower ratings and application for each particular unit.

11. All motor accessories, heaters, detectors, etc., shall be submitted.

12. Certificates of Compliance:

    a. Certified copies of motor characteristic curves and all other data necessary for establishing control and protective equipment settings shall be submitted.

13. Operation and maintenance manuals shall be submitted in accordance with the Detailed Specifications.

1.5 REFERENCE STANDARDS

A. Institute of Electrical and Electronics Engineers (IEEE)

B. National Electrical Manufacturers Association (NEMA)

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.6 QUALITY ASSURANCE

A. Routine tests shall be performed on representative motors, and shall include the information described on NEMA MG1-12.55 "Routine Tests for Polyphase Medium Induction Motors". Efficiency shall be determined in accordance with IEEE Publication No. 112, Method B. Power factor shall be measured on representative motors.

1.7 SYSTEM DESCRIPTION

A. Motors specified herein are three phase, squirrel cage induction type for 1/2 Hp and above; single phase for less than 1/2 Hp; or DC motors.

1.8 ACCESSORIES

A. General:

1. Motor accessories shall be provided in accordance with the requirements specified under this section unless otherwise stated in the driven equipment specifications.

2. Each outdoor motor 5 horsepower and larger shall be provided with space heaters. 5 horsepower and larger enclosed motors installed indoors in damp, unheated spaces shall also be provided with space heaters.

3. Winding thermal protection, thermostat type shall be provided for each motor in accordance with the following:

a. Submersible motors and explosion proof motors.

b. Variable speed motors up to 25 horsepower.

4. Winding thermal protection, thermistor type shall be provided for each motor in accordance with the following:

a. Constant speed motors 50 horsepower and larger up to 200 horsepower.

b. Variable speed motors 30 horsepower and larger up to 200 horsepower.

5. Space heaters, stator and bearing temperature detectors shall be provided for each motor 250 horsepower and larger.

6. Cranes, elevators, hoists, and other devices complying with special safety codes shall be furnished complete with their control equipment, and with all accessories and safety devices for approved safe and efficient operation.

B. Space Heaters:

1. Space heaters for condensation prevention shall be rated 120 volt. Wattage shall be suitable for the particular frame size and type in accordance with the manufacturers recommendation.

2. Space heater wire leads shall be brought out to an auxiliary conduit box on the motor. Box construction shall match main power conduit box.

C. Motor Winding Thermal protection

1. Winding thermal protection shall be in accordance with the following:

a. Thermostats shall be bi-metal disk or rod type embedded in the stator windings. Thermostat contacts shall be automatic reset type, rated 120 volt AC, 5 amps minimum opening on excessive temperature.

b. Thermistors embedded in each stator phase winding shall be in direct contact with the winding conductors. Each thermistor circuit shall be factory wired to 120 volt solid state control module mounted at the motor in a NEMA 4X box. The control module contacts shall be automatic reset type, rated 120 volt AC, 5 amps minimum opening on excessive temperature.

c. Resistance temperature detectors shall be 100 ohm precision type with calibrated resistance-temperature characteristics. Detectors, two per phase, shall be positioned to detect highest winding temperature and located between coil sides in stator slots. Detector leads shall be wired to a separate NEMA 4X terminal box.

D. Bearing Temperature Protection:

1. Bearing temperature detectors RTD type similar to the motor winding detectors specified herein, shall be provided on each bearing for horizontal motors and on the thrust bearing for vertical motors.

E. Single Phase Motors: Single phase motors requiring auxiliary starting resistors, capacitors or reactors and switching devices shall be furnished as combination units with such auxiliaries either incorporated within motor housings or housed in suitable enclosures, mounted upon motor frames. Each combination unit shall be mounted upon a single base and shall be provided with a single conduit box.

1.9 PAINTING

A. External Surfaces:

1. All severe duty motors shall have all external surfaces pretreated, primed and painted. External surfaces shall be pretreated so the surface is clean and free of contaminants. After pretreatment, the surface shall be primed with an oxide primer and then spray painted with a minimum of .003 inch thick epoxy polyamide and semi-gloss coating that is chemical, solvent, salt water, and acid resistant.

2. All other motors shall have external surfaces pretreated, primed and painted in accordance with the manufacturer's standard treatment.

B. Internal Surfaces:

1. All severe duty motors shall have all internal surfaces pretreated, primed and painted. Internal surfaces shall be pretreated so the surface is clean and free of contaminants. After pretreatment, the surface shall be primed with an oxide primer and then painted with an epoxy paint. Machined joints and threaded parts shall be coated with rust inhibiting compound.

2. All other motors shall have internal surfaces pretreated and primed in accordance with the manufacturer's standard treatment.

C. Other Surfaces:

1. All machined bolts and screws and other hardware shall be of the hex head type and shall be zinc plated. Stainless steel hardware shall be used on severe duty motors.

1.10 SPARE PARTS

A The Contractor shall furnish and deliver to the Engineer, at that part of the site and at such time as the Engineer may direct, spare parts for the electric motors in accordance with the Specifications.

B. The spare parts shall be listed in an index and packed in containers suitable for long term storage, bearing labels clearly designating the manufacturer's part number with complete information for use and reordering.

1. Lubricants: The Contractor shall furnish as part of the bulk lubricant order the quantity of lubricants required to operate and maintain the motors furnished under this section for a period of one year after acceptance. As a minimum, there shall be provided sufficient oil and grease to make a least one lubricant change for each motor as applicable. Replace all lubricants used during startup and testing prior to acceptance of equipment. Furnish this replacement lubricant in addition to the lubricants included in the bulk order.

1.11 DELIVERY, STORAGE AND HANDLING

A. Electric motors shall be delivered, stored and handled in accordance with the Detailed Specifications, the motor manufacturers instructions and the following:

1. Motors shall be inspected for shipping damage when received.

2. All sleeve or oil lubricated bearings motors shall be identified and the bearing reservoirs filled to normal level.

a. Motors shall be handled using motor base lifting lugs. Avoid pounding or bumping of motor which may damage motor. A hoist and spreader bar arrangement shall be used to avoid damage.

b. Motors shall be stored indoors in clean, dry heated areas.

c. Motor space heaters shall be energized to prevent moisture condensation throughout the storage and construction period.

B. Motors shall not be stored in areas subject to continuous vibration. A small quantity of grease shall be injected into each bearing on a monthly basis. Purged grease shall be inspected for water or rust. Motor shaft shall be rotated by hand to check for binding.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. RATING

1. Each motor shall develop ample torque for its required service throughout its acceleration range at a voltage 10 percent below nameplate rating. Where shown on the Electrical Drawings to be operated on a reduced voltage starter, the motor shall develop ample torque under the conditions imposed by the reduced voltage starting method. The motor shall not be required to deliver more than its rated nameplate horsepower, at unity (1.0) service factor, under any condition of mechanical or hydraulic loading. All motors shall be continuous time rated suitable for operation in a 40 degrees C ambient unless noted otherwise. Specific motor data such as Hp, rpm, enclosure type, etc, is specified under the specification for the equipment with which the motor is supplied.

B. ENCLOSURE TYPES

1. Motors specified herein shall conform to one of the following standard enclosure designs:
a. Open Drip Proof

b. Totally Enclosed Fan Cooled (TEFC)

c. Totally Enclosed Non-Ventilated (TENV)

d. Explosion Proof

e. Severe Duty

f. Inverter Duty

C. NAMEPLATES

1. The motor manufacturer's nameplates shall be engraved or embossed on stainless

steel and fastened to the motor frame with stainless steel screws or drive pins.

Nameplates shall indicate clearly all of the items of information enumerated in

NEMA Standard MG1- Part10 or MG1- Part 20, as applicable.

D. CONDENSATION HEATERS

1. Condensation heaters, where specified under the detailed mechanical specifications shall be of the cartridge or flexible wrap around type installed within the motor enclosure adjacent to core iron. Heaters shall be rated for 120 Volt, single phase with wattage as required. The heater wattage and voltage shall be embossed on the motor nameplate. Power leads for heaters shall be brought

out at the motor lead junction box. All motors with condensation heaters shall be energized upon arrival at the site

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 THREE PHASE MOTORS-FRAMES 143T THROUGH 449T

A. General

1. Unless otherwise specified, motors 1/2 Hp and larger shall be 3 Phase, squirrel cage induction type unless it stated otherwise.

2. All motors 3/4 Hp and larger shall be a NEMA frame 143T or larger. 1/2 Hp motors and 3/4 Hp motors rated 1800 and 3600 rpm, shall be a 56 frame. Motors shall be designed and connected for operation on a 480 Volt, 3 Phase, 60 Hz alternating current system. Dual voltage (230/460) rated motors are acceptable.

3. Unless otherwise required by the load, all motors shall be NEMA Design B, normal starting torque. Locked rotor kVA/Hp shall not exceed Code Letter G as described in NEMA Standard MG1-10.37 for motors 20 Hp and larger.

4. Motors connected to variable frequency drives shall be inverter duty rated.

5. Motors shall be by the following manufacturers

a) U.S. Electrical Motors, Division of Emerson Electric Co.

b) Baldor Electric

c) Dayton

d) Or approved equal.

B. Bearings

1. Anti-friction motor bearings shall be designed to be regreasable and initially shall be filled with grease suitable to ambient temperature of 40 degrees C. Bearings shall be ABMA Types

BC or RN, heavy duty, or shall otherwise be shown to be suitable for the intended application in terms of B-10 rating life, Class M3 or better.

2. All grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic type by the Alemite Division of the Stewart-Warner Corporation.

C. Insulation

1. Insulation systems shall be Class F, operated at Class B temperature rise and shall be manufacturer's premium grade, resistant to attack by moisture, acids, alkalies and mechanical or thermal shock for 480 Volt motors. Provide 80 degree C, Class B rise or better by resistance at 100 percent load and provide a Class F insulation system, suitable for an ambient temperature motor operation of 0 to 40 degree C at no more than 3300 feet above sea level for medium voltage motors. This temperature rise shall be met when motors are operated and controlled with the VFD(s). The motor insulation system shall have full capability to handle the common mode voltage conditions imposed by the VFD.

2. Motors for outdoor service shall have vacuum/pressure impregnated epoxy insulation for moisture resistance.

3. Insulation for inverter duty motor windings shall meet or exceed the Pulse Endurance Index for magnetic wire and shall not be injured when exposed to repeated pulse type waveforms, repetitive high voltage transients, switching frequency and rate of rise of the pulse. Class H varnish shall be used.

D. Enclosures

1. Motors shall have a steel or cast iron frame and a cast iron conduit box, as specified below. Conduit box shall be split from top to bottom and shall be capable of being rotated to four positions. Synthetic rubber-like gaskets shall be provided between the frame and the conduit box and between the conduit box and its cover. Motor leads shall be sealed with a non-wicking, non-hygroscopic insulating material. A frame mounted pad with drilled and tapped hole, not less than 1/4-in diameter, shall be provided inside the conduit box for motor frame grounding.

2. Totally enclosed fan cooled: TEFC motors shall have a steel or cast iron frame, cast iron end brackets, cast iron conduit box, 1.15 service factor at 40 degrees C, tapped drain holes (corrosion resistant plugs for frames 286T and smaller and automatic breather/drain devices for frames 324T and larger) and upgraded insulation by additional dips and bakes to increase moisture resistance.

3. Totally enclosed non-ventilated: TENV motors shall include the same rating and accessories as specified for TEFC motors.

4. Explosion proof: Explosion proof motors shall have a cast iron frame, cast iron end brackets, cast iron conduit box, 1.15 service factor at 40 degrees C, tapped drain holes (corrosion resistant plugs for frames 286T and smaller and automatic breather/drain devices for frames 324T and larger) and be UL listed for Class 1, Div. 1, Group D hazardous areas.

5. Severe duty: Motors shall be of the corrosion resistant type conforming to motors designated by the manufacturer as "Corro-Duty", "Mill and Chemical", "Custom Severe Duty", or similar quality designation. Severe duty motors shall have a cast iron frame, cast iron end brackets, cast iron conduit box and 1.15 service factor at [40] degrees C and tapped drain holes (corrosion resistant plug for frames 286T and smaller and automatic breather/drain devices for frames 324T and larger).

E. Inverter Duty Rated Motors

1. Inverter duty rated: Motors for operation on variable frequency drives shall meet current power quality levels published in NEMA MG1, Part 31. Consideration shall be given to the primary factors of the variable frequency drive such as the modulation scheme (six-step, PWM, etc), the switching or carrier frequency and the type of power output devices utilized (IGBT etc). Consideration shall also be given to the installation methods such as output cable length, cable installation method, installation of output filters, etc. Enclosures shall be equal to those furnished for severe duty or explosion proof motors. Motor non- drive end bearings shall be insulated. Internal service factor shall be 1.0 that of the nameplate. Unless otherwise noted provide enclosures suitable for “severe duty”. Motors shall be furnished with an internal thermal switch. Ventilation system shall be designed for maximum heat transfer. Stator laminations shall be stagger-stacked and stamped from high grade electrical steel to minimize eddy-current losses and heat build-up caused by inverter induced harmonics. Rotors shall be configured to minimize skin-effect heating.

F. Motor Efficiencies

1. Three phase motors rated 1 Hp and larger shall be of the premium efficiency type. Motors shall have a NEMA Nominal Efficiency not less than the values indicated below. Efficiency values shall be based on tests performed in accordance with IEEE Publication No. 112, Method B. Motors with horsepower or rpm's not listed shall conform to comparable standards of construction and materials as those for listed motors.

2. Where State Energy Codes or Utility Company Energy Rebate Programs dictate higher efficiencies than those listed, the higher efficiency motors shall be furnished.

Full Load Efficiencies

	OPEN MOTORS			
	3600 RPM Minimum	1800 RPM Minimum	1200 RPM Minimum	900 RPM Minimum
Hp	Nominal Efficiency	Nominal Efficiency	Nominal Efficiency	Nominal Efficiency
1.0	--	85.5	82.5	--
1.5	85.5	86.5	86.5	--
2.0	86.5	86.5	87.5	--
3.0	86.5	89.5	89.5	--
5.0	89.5	89.5	89.5	--
7.5	89.5	91.0	91.7	--
10.0	90.2	91.7	91.7	--
15.0	91.0	93.0	92.4	--
20.0	92.4	93.0	92.4	92.4
25.0	93.0	93.6	93.0	92.4
30.0	93.0	94.1	93.6	93.6
40.0	93.6	94.1	94.1	93.6
50.0	93.6	94.5	94.1	93.6
60.0	94.1	95	95.0	94.1
75.0	94.5	95	95.0	94.5
100.0	94.5	95.4	95.0	95.0
125.0	95.0	95.4	95.4	95.0
150.0	95.4	95.8	95.8	95.0
200.0	95.4	95.8	95.4	95.4

ENCLOSED MOTORS

	3600 RPM Minimum	1800 RPM Minimum	1200 RPM Minimum	900 RPM Minimum
Hp	Nominal Efficiency	Nominal Ef-ficiency	Nominal Ef-ficiency	Nominal Ef-ficiency
1.0	80.4	85.5	82.5	83.5
1.5	85.5	86.5	87.5	84.9
2.0	86.5	86.5	88.5	85.5
3.0	88.5	89.5	89.5	85.7
5.0	89.5	89.5	89.5	89.9
7.5	91	91.7	91.7	90.6
10.0	91.7	91.7	91.7	90.3
15.0	91.7	92.4	92.4	90.7
20.0	92.4	93.0	92.4	91.6
25.0	93.0	93.6	93.0	91.8
30.0	93.0	93.6	93.6	92.7
40.0	93.6	94.1	94.1	93.0
50.0	94.1	94.5	94.1	93.4
60.0	94.1	95.0	94.5	93.3
75.0	94.5	95.4	95.0	94.5
100.0	95.0	95.4	95.4	94.7
125.0	95.4	95.4	95.4	95.1

2.4 SINGLE-PHASE MOTORS

A. Unless otherwise specified, motors smaller than 1/2 Hp shall be single phase, capacitor start. Small fan motors may be split-phase or shaded pole type if such are standard for the equipment. Wound rotor or commutator type single-phase motors are not acceptable unless their specific characteristics are necessary for the application.

B. Motors shall be rated for operation at 115 Volts, single phase, 60 Hz.

C. Locked rotor current shall not be greater than specified in NEMA Standard MGI-12.37, Design "N".

D. Motors shall be totally-enclosed in conformance with NEMA Standards. Small fan motors may be open type if suitably protected from moisture, dripping water

and lint accumulation.

E. Motors shall be provided with sealed ball bearings lubricated for 10 years normal use.

F. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

G. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

H. Motors 1/20 HP and Smaller: Shaded-pole type.

I. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Motors shall be installed in accordance with manufacturer's instructions and recommendations.

B. Each motor shall be carefully and properlyaligned with the driven equipment.

C. Equipment shall be secured to mounting surface with anchor bolts. Anchor bolts shall be provided meeting manufacturer's recommendations and of sufficient size and number to secure equipment.

D. Motor nameplates shall be installed for identification of equipment. Nameplates shall be provided in accordance with the requirements of Specification 15076- Piping and Equipment Identification.

END OF SECTION 23 05 13

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.
6. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 Manufacturers:

1. Advance Products & Systems
2. Calpico, Inc.
3. GPT; an EnPro Industries
4. Or approved equal

2.2 SLEEVES

A. Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop collar.

B. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, anti-corrosion coated or zinc coated, with plain ends and integral welded waterstop collar.

C. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

D. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

E. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.3 STACK-SLEEVE FITTINGS

A. Description: Manufactured, Dura-coated or Duco-coated galvanized cast-iron sleeve with integral cast flashing flange for use in waterproof floors and roofs. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.4 SLEEVE-SEAL SYSTEMS

A. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20-psig.
3. Sealing Elements: EPDM-rubber or High-temperature-silicone or Nitrile (Buna N) interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
4. Pressure Plates: Stainless steel.
5. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, ASTM B633 or Stainless steel of length required to secure pressure plates to sealing elements.

2.5 SLEEVE-SEAL FITTINGS

A. Description:

1. Manufactured plastic, sleeve-type, waterstop assembly, made for imbedding in concrete slab or wall.
2. Plastic or rubber waterstop collar with center opening to match piping OD.

2.6 GROUT

A. Description: Nonshrink, recommended for interior and exterior sealing openings in nonfire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.7 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C920, Type S, Grade NS, Class 25, use NT.

B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.

C. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout or silicone sealant, seal space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke-Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 3 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using waterproof silicone sealant, seal space between top hub of stack-sleeve fitting and pipe.

B. Fire-Resistance-Rated, Horizontal Assembly, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal-system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings as new walls and slabs are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout or silicone sealant, seal space around outside of sleeve-seal fittings.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

3.6 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls Above Grade:

a. Piping Smaller Than NPS 6: Cast-iron sleeves or Steel pipe sleeves.
b. Piping NPS 6 and Larger: Cast-iron pipe sleeves or Steel pipe sleeves

2. Exterior Concrete Walls Below Grade:

a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system or Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron pipe sleeves with sleeve-seal system or Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system or Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron pipe sleeves with sleeve-seal system or Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs Above Grade:

a. Piping Smaller Than NPS 6: Steel pipe sleeves or Stack-sleeve fittings or Sleeve-seal fittings.
b. Piping NPS 6 and Larger: Steel pipe sleeves or Stack-sleeve fittings.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Steel pipe sleeves or PVC-pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel sheet sleeves.

END OF SECTION 230517

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 230518 - ESCUTCHEONS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

2. Escutcheons for Existing Piping:

a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
e. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge.
f. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 230518

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 230548 "Vibration and Wind Controls for HVAC" for vibration isolation devices.
3. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified Professional Engineer licensed in the same State as the Site, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified Professional Engineer in the same State as the Site responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.
3. Pipe Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure and spring deflection changes. Include certification that riser system was examined for excessive stress and that none exists.
4. Include rated load, rated deflection, and overload capacity for each vibration isolation device and restraint component.
5. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and restraint component required.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation for HVAC piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Welding certificates.

C. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Design criteria and performance requirements for hangers and supports for HVAC piping and Equipment shall be obtained from the structural drawings and specifications or as it stated in this Section.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

2.9 Supports for Pipelines with Thermal Expansion:

A. Pipe rolls for single rod hangers: Stainless steel frame construction, ductile iron roller and stainless steel roller rod provided with threaded nuts; vertical adjustment permitted; for pipe sizes 6 inches or less unless otherwise approved.

B. Pipe rolls for double rod hangers: Ductile iron roller, stainless steel roller rod, malleable iron threaded sockets which permit vertical adjustment.

2.10 Pipe Insulation Protection

A. Contractor shall furnish steel protection saddles on all supports for insulated pipe.

1. For pipe sizes less than 12 inches in diameter, provide saddles of No. 14 U.S. gauge stainless steel curved 180 degrees for use with roller hangers or structural trapeze hangers and of No. 16 U.S. gauge stainless steel curved 120 degrees for use in clevis hangers Saddles shall be at least 12-inches long. Saddle gripping side edges shall be turned up at least to the thickness of insulation.
2. For pipe 12 inches in diameter and larger, provide saddles of No. 12 U.S. gauge stainless steel with a welded centerplate to provide three-edge support. Saddles shall be at least as long as the pipe diameter, provide 120 degree coverage and have edge and centerplate depths equal to the insulation thickness. Before placing the saddles, saddles shall be filled with either insulating cement or high density insulation cut to fit. For vapor barrier insulation, the barrier must be maintained; contact between hanger and support and bare pipe will not be permitted.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

RECOMMENDED HANGER SPACING AND ROD SIZE FOR STEEL PIPE

Nominal Pipe Size (inches)	Maximum Span* (feet)	Recommended Hanger Rod Sizes (single rod – inches)	Recommended Hanger Rod Sizes (double rod – inches)	Maximum Load Per Hanger (lbs.)
3/4”	7	3/8”	3/8”	300
1”	7	3/8”	3/8”	300
1 1/4”	7	3/8”	3/8”	300
1 1/2”	9	3/8”	3/8”	300
2”	10	3/8”	3/8”	325
2 1/2”	11	1/2”	3/8”	350
3”	12	1/2”	3/8”	400
3 1/2”	13	1/2”	3/8”	450
4”	14	5/8”	1/2”	850
5”	16	5/8”	1/2”	950
6”	17	3/4”	5/8”	1075
8”	19	7/8”	5/8”	1350
10”	22	7/8”	5/8”	1750
12”	23	7/8”	3/4”	2200
14”	25	1”	7/8”	2500
16”	27	1”	7/8”	3075
18”	28	1”	7/8”	3700
20”	30	1 1/4”	1”	4425
24”	32	1 1/4”	1”	6050

Based on MSS SP-69 Table 3 & 4.
*For hanger spacing greater than 10’-0”, many codes require pipe hangers to be spaced a maximum of every 10’ (3.048 meters) regardless of size. Check local codes. Local codes apply.
Spacing and capacities are based on water filled pipe plus 50 lbs. /ft. dead load. Closer hanger spacing may be required where additional valves and fittings increase the load.

RECOMMENDED HANGER SPACING AND ROD SIZE FOR COPPER TUBING

Nominal Tubing Size (inches)	Maximum Span* (Feet)	Recommended Hanger Rod Sizes (inches)
1/2”	5	3/8”
3/4”	5	3/8”
1”	6	3/8”
1 1/4”	7	3/8”
1 1/2”	8	3/8”
2”	8	3/8”
2 1/2”	9	1/2”
3”	10	1/2”
3 1/2”	11	1/2”
4”	12	1/2”
5”	13	1/2”
6”	14	5/8”
8”	16	3/4”

Based on MSS-SP-69, Table 3 & 4.

*For hanger spacing greater than 10’-0”, many codes require pipe hangers to be spaced a maximum of every 10’ (3.048 meters) regardless of size. Check local codes. Local codes apply. Spacing and capacities are based on water filled pipe plus 50 lbs./ft. dead load. Closer hanger spacing may be required where additional valves and fittings increase the load.

B. Tubing less than 1-inch diameter: In accordance with best piping practice and ASME B31.1, and as approved by the Engineer.

Additional supports shall be placed immediately adjacent to any change in piping direction, at equipment, and on both sides of valves, expansion joints and couplings.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and wind movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in the 09 Painting specifications.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Vertical-Piping Clamps, Hanger Rods Attachments, and Building Attachments. Unless otherwise indicated and except as specified in piping system Sections, install the following types:

Horizontal-Piping Hangers and Supports			
Type	MSS	NPS	Use
Adjustable, Steel Clevis Hangers	Type 1	NPS 1/2 to NPS 30	For suspension of non-insulated or insulated, stationary pipes
Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps	Type 3	NPS 3/4 to NPS 36	For suspension of pipes, requiring clamp flexibility and up to 4 inches of insulation
Steel Pipe Clamps	Type 4	NPS 1/2 to NPS 24	For suspension of cold and hot pipes if little or no insulation is required
Adjustable Pipe Saddle Supports	Type 38	NPS 2-1/2 to NPS 36	For stanchion-type support for pipes if vertical adjustment is

			required, with steel-pipe base stanchion support and cast-iron floor flange
Adjustable Roller Hangers	Type 43	NPS 2-1/2 to NPS 24	For suspension of pipes, from single rod if horizontal movement caused by expansion and contraction might occur
Vertical-Piping Clamps			
Extension Pipe or Riser Clamps	Type 8	NPS 3/4 to NPS 24	For support of pipe risers
Carbon- or Alloy-Steel Riser Clamps	Type 42	NPS 3/4 to NPS 24	For support of pipe risers if longer ends are required for riser clamps
Hanger-Rod Attachment			
Steel Turnbuckles	Type 13	-	For adjustment up to 6 inches for heavy loads
Steel Clevises	Type 14	-	For 120 to 450 F piping installations
Swivel Turnbuckles	Type 15	-	For use with MSS Type 11, split pipe rings
Malleable-Iron Sockets	Type 16	-	For attaching hanger rods to various types of building attachments
Steel Weldless Eye Nuts	Type 17	-	For 120 to 450 F piping installations
Building Attachments			
Steel or Malleable Concrete Inserts	Type 18	-	For upper attachment to suspend pipe hangers from concrete ceiling
Top-Beam C-Clamps	Type 19	-	For use under roof installations with bar-joist construction, to attach to top flange of structural shape. Provide retaining strap
Welded Beam Attachments	Type 22	-	For attaching to bottom of beams if loads are considerable and rod sizes are large
C-Clamps	Type 23	-	For structural shapes
Steel-Beam Clamps with	Type 28	-	For attaching to bottom of steel I-

Eye Nuts			beams for heavy loads
Linked-Steel Clamps with Eye Nuts	Type 29	-	For attaching to bottom of steel I-beams for heavy loads, with link extensions
Malleable-Beam Clamps with Extension Pieces	Type 30	-	For attaching to structural steel
Welded-Steel Brackets (light)	Type 31	-	For support of pipes from below or for suspending from above by using clip and rod - up to 2" pipe
Welded-Steel Brackets (med)	Type 32	-	For support of pipes from below or for suspending from above by using clip and rod - 2 to 4" pipe
Welded-Steel Brackets (heavy)	Type 33	-	For support of pipes from below or for suspending from above by using clip and rod - over 4" pipe

J. Supports for Vertical Piping:

1. Riser clamp shall be placed under hub, fitting or coupling with approved solid bearing on steel sleeve.
2. Where riser clamps are used with plastic piping they shall be modified so as not to exert any compressive forces on the pipe.
3. Vertical piping shall be supported at each floor and between floors by stays or braces to prevent rattling and vibration. Maximum spacing shall not exceed 25 feet.
4. Base elbows or welded equivalent shall be provided at vertical piping bases.
5. Top support shall have a horizontal connection, and provide for pipe expansion.

K. Pipelines installed under plumbing work shall be spaced in conformity with the requirements of the International Building Code or as specified in the Specifications.

L. Pipelines installed under plumbing work shall be spaced in conformity with the requirements of the International Building Code or as specified in the Specifications Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners instead of building attachments where required in concrete construction.

O. Hanger rods shall be attached to existing concrete structures using stainless steel expansion anchors.

A1349-00 INTERIOR CONSTRUCTION, RENOVATION AND UPGRADES

END OF SECTION 230529

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 230548 VIBRATION AND WIND CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 Description

A. Scope:

1. Contractor shall provide all professional services, labor, materials, tools, equipment, and incidentals as shown, specified, and required to design, furnish, and install vibration control, and wind control for HVAC and associated instrumentation and control components.
2. Extent of components requiring controls are described in this section and as required by laws and regulations. The work includes:

   a. Vibration Controls for Components.
   b. Wind Controls for Components.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the vibration, and wind controls Work.

C. Related Sections:

1. Section 099123 – Interior Painting
2. Section 230553 - Identification for HVAC Piping and Equipment.
3. Section 230529 – Hangers and Supports for HVAC Piping and Equipment
4. Section 233416 - Centrifugal HVAC Fans
5. Section 233600 - Air Terminal Units
6. Section 237433 – Packaged, Dedicated Outdoor Air Units (DOAS)
7. Section 238124 - Control-Room Air-Conditioners
8. Section 238128 - Ductless Split-System Heat Pump
9. Section 238129 – Variable Refrigerant Flow HVAC Systems
10. Section 238239.16 – Electric Unit Heaters

1.2 References

A. Standards referenced in this Section are:

1. AWS D1.1, Structural Welding Code – Steel.
2. AWS D1.2, Structural Welding Code – Aluminum.
3. AWS D1.3, Structural Welding Code – Sheet Steel.
4. AWS D1.6, Structural Welding Code – Stainless Steel.
5. CISCA 0-2, Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings, Seismic Zones 0-2.
6. CISCA 3-4, Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings, Seismic Zones 3-4.
7. National Roofing Contractors Association (NRCA) Standards.

1.3 Definitions

A. The following definitions are used in this Section:

a. Certificate of compliance: certificate provided by component manufacturer indicating that component has been tested or analyzed in accordance with laws and regulations, including applicable building code, and is capable of resisting design forces defined in laws and regulations.
b. Components: HVAC, plumbing, fire protection, electrical, instrumentation and control, architectural, and other non-structural equipment, systems, and elements permanently attached to structures, including supporting structures and attachments.
c. Component Assembly: Component assembled by Contractor from individual components of different Suppliers.
d. Controls: Vibration Control, and Wind Control.
e. Controls Design Engineer: Professional Engineer licensed in same state as the Site responsible for Vibration Control, and Wind Control.
f. Failure: Separation of an attachment between Components, or Components and structure, vertical permanent deformation greater than 1/8-inch, horizontal permanent deformation greater than 1/4-inch, or failure of the equipment to perform its function.
g. Hazardous Contents: Material that is highly toxic or potentially explosive in sufficient quantity to pose significant life-safety threat to personnel working in building or the general public if an uncontrolled release were to occur.
h. Importance Factor (Ip): Factor that accounts for degree of hazard to human life and damage to property.
i. Isolated Component: Component indirectly connected to structure through Control designed to prevent transmission of Component vibration to structure.
j. Lateral Forces: Horizontally applied forces resulting from wind, combined with operational horizontal forces. Wind forces are considered separately.
k. Life Safety Systems: All systems involved with fire protection including sprinkler piping, water service piping, jockey pumps, fire pumps, fire dampers, smoke dampers, smoke exhaust systems, control panels and fire alarm panels associated with fire protection Components, and Components in Essential Facilities necessary for keeping the Essential Facility Operational.
l. Non-Isolated Component: Component that is connected to structure in such a way that allows transmission of Component vibration to structure.
m. Operational: Capable of providing intended function.
n. Process Mechanical: All mechanical Components that are not part of HVAC, plumbing and fire protection Components.
o. Vibration Control: Vibration isolating systems.
p. Wind Control: Wind restraining systems.

1.4 Quality Assurance

A. Qualifications:

1. Contractor:

a. Design and analysis delegated through Contractor shall be performed by a registered Professional Engineer licensed in same state as the Site.

2. Controls Design Engineer:

    a. Engage registered Professional Engineer licensed in same state as the Site, who has a minimum of five years of experience in providing engineering services for Vibration, and Wind Controls.
    b. Submit qualifications data and include professional liability insurance certificate in amount of at least $1,000,000 per claim/aggregate with maximum deductible of $100,000.
    c. Responsibilities include:

        1) Reviewing performance and design criteria for Controls specified in the Contract Documents.
        2) Determining sizes and locations of Controls.
        3) Preparing or supervising preparation of design calculations and related drawings, Shop Drawings and submittals, testing plan development, test result interpretation, and comprehensive engineering analysis verifying compliance of Controls with the Contract Documents.
        4) Signing and sealing all calculations, design drawings, and Shop Drawings.
        5) Certifying that:
            a) Design of Controls was performed in accordance with performance and design criteria stated in the Contract Documents.
            b) Design conforms to Laws and Regulations, and to prevailing standards of practice.
        6) Provide installation instructions and drawings.
        7) Provide field quality control in accordance with Paragraph 3.3 of this Section.

3. Installer:

    a. Engage an experienced installer to perform the Work of this Section who specializes in installing Controls similar to that required for this Project.
    b. Submit name and qualifications to Engineer with the following information on a minimum of three completed, successful projects:

        1) Names and telephone numbers of Owners, and Architects or Engineers responsible for project.
        2) Approximate cost of Control Work for which installer was responsible.

4. Welder:

    a. Qualify welding processes and welding operators in accordance with AWS D1.1, D1.2, D1.3, and D1.6 as appropriate for material to be welded.
    b. Provide certification that welders employed on or to be employed for the Work have satisfactorily passed AWS qualification tests within previous 12 months. Ensure that all certifications are current.

1.5 Submittals

A. Informational Submittals: Submit the following:

1. Shop Drawings:

a. Detailed schedules of flexible and rigidly mounted Components to receive Controls. Schedules shall be numbered and include Contract Drawing number references where Component is located.
b. Fabrication details of Component bases including dimensions, structural member sizes, support point locations, and weight distribution.
c. Specific details of Controls and anchorages, including number, size, and locations for each Component.
d. Details of suspension and support for ceiling-hung Components.
e. Details of attachment methods where walls, floors, slabs, or supplementary steel work are used for restraint attachment.
f. Location of all attachment and support points and forces transferred to supporting structure at each location, as a result of each load combination of static forces and Lateral Forces.
g. Detailed piping, ductwork, and conduit restraining system layout drawings showing their attachment to building or structure. Include dimensions, size, and location of restraints and attachment connections. Coordinate with system layout shop drawings provided under other sections, as applicable.

2. Product Data:

a. Model of Controls.
b. Literature, performance data, weight, illustrations, specifications, identification of materials of construction, dimensions of individual parts, and finishes.
c. Setting drawings, templates, and directions for installation of anchor bolts and other anchorages.

3. Certifications:

a. Component Certificates of Compliance: Where Component Suppliers are required by Laws and Regulations to provide a Certificate of Compliance for Components, submit the following:

1) Component Certificate of Compliance from an agency that is accepted by authority having jurisdiction for compliance with building code.

b. Provide completed Professional Design Services Performance Certification on Attachment 230548-A to this Section.
c. Controls Design Engineer's professional liability insurance certificate per Paragraph 1.4.2.b of this Section.

4. Delegated Design Submittals:

a. Information required to clearly demonstrate basis of design for Controls, including calculations, design dimensions, approach and assumptions, and Laws and Regulations on which design of Controls and anchorage is based. Design documents prepared by Controls Design Engineer shall bear the seal and original signature and date of the Controls Design Engineer. State of Engineer's registration, name, and license in the state of NJ number shall be clearly legible on the seal.

5. Test Reports:

a. Component test reports to confirm statements made on Certificate of Compliance, for Components where a Certificate of Compliance is required.

6. Manufacturer's Instructions:

a. Instructions for shipping, storage protection, handling, and installation.
b. Routine maintenance requirements prior to start up.

7. Field Quality Control Submittals:

a. Field Reports: Submit reports confirming that Controls have been installed in accordance with Supplier's recommendations and approved Shop Drawings and submittals.
b. Controls Design Engineer Report: Submit report confirming that Controls have been installed in accordance with the Controls design. Report shall bear the professional engineering seal, date, and original signature of the Controls Design Engineer.

8. Qualifications Statements: Submit qualifications for:

a. Manufacturer.
b. Controls Design Engineer.
c. Installer.
d. Welder.

B. Closeout Submittals:

1. Operation and Maintenance Data:

a. Submit complete operation, and maintenance manuals, including, test reports, maintenance data and schedules, description of operation, and spare parts information.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

Design and performance criteria for the vibration and wind controls of HVAC systems shall be obtained from the structural drawings and specifications or as it stated in this Section.

A. System Description:

1. Schedules in Part 3 of this Section describe Components that are to receive Vibration Control and Wind Control.
2. Tables in Part 3 and performance criteria specified in Paragraph 2.1.C of this Section describes Controls to be provided on Components and systems described in the schedules. Tables are general in nature and may include certain Components that may not be specified in the schedules to receive Controls, while the schedules are Project-specific.
3. Where components are subject to wind, design component and related anchorage to supporting structure to resist wind loads per applicable building code using wind load factors indicated on structural drawings. Using guy wires is allowed for assisting in support of components.
4. Design of Components, including Vibration Controls provided by Component if required, and associated anchorage to supporting structure, are delegated through Controls Design Engineer.

5. Interconnection design of Component Assemblies, including Vibration Controls if required, and anchorage to supporting structure, shall be by Controls Design Engineer. Coordinate design with each Component used in the assembly and obtain approval of each manufacturer prior to providing Shop Drawings for Component Assembly.

6 Equivalency: Products or methods specified for Controls are not intended to limit use of other products or methods of equivalent or superior quality and effectiveness.

B. Design Criteria:

1. Wind Speed is 120 MPH or as it stated on the structural drawings whichever is more stringent.
2. Design Wind Controls to accept, without failure, wind forces acting on Component's exposed wind surface area. Analyses for wind forces shall consider Lateral Forces applied on a minimum of two orthogonal axes in two directions per axis. Overturning moments may result in uplift forces that exceed gravitational forces at ground level that shall be incorporated into analysis.

C. Performance Criteria:

1. Design and provide Components to maintain structural integrity and to provide continuous load path to transfer Lateral Forces through elements of Component and through anchorage to supporting structure.
2. Fan and compressor Components shall be protected against excessive displacement that results from high air thrust in relation to Component weight. Horizontal thrust restraints shall be provided when horizontal motion exceeds 3/8-inch.
3. Internally Isolated Components, when provided in lieu of external isolation and restraint systems, shall conform to requirements of this Section.
4. Wind rated curb or roof rail-mounted Components shall be attached to the curb or rails that shall, in turn, be attached to supporting structure, creating continuous load path for vertical and Lateral Forces. Sheet metal screw attachment is unacceptable. Coordinate wind rated curb and rail-mounted Components with structural drawings and specification for tie in/anchoring.
5. Where location and characteristics of elements of supporting structure are not appropriate for supporting Component and transferring vertical and Lateral Forces, notify Engineer in writing.
6. Where changes in specified Components or location of Components are proposed by Contractor for convenience of Contractor and accepted by Engineer, modifications to supporting structure required by such changes shall be responsibility of Contractor at no additional cost to Owner. Design of modification shall consider all vertical and Lateral Forces and be signed, dated, and sealed by Controls Design Engineer.
7. Where ceilings are not braced, lighting fixtures shall have independent four corner diagonal wire ties to structure.
8. Design lay-in ceilings, including accessory Components, in accordance with CISCA 0-2 or CISCA 3-4, as applicable.

2.2 Manufacturers

A. Provide products of one of the following:

1. Vibration Mountings and Controls, Inc.
2. Mason Industries.
3. Kinetics Noise Control.
4. Or approved equal.

2.3 VIBRATION ISOLATION TYPES

A. Type A: Spring Isolator - Free Standing

1. Spring isolators shall be free standing and laterally stable without housing, and complete with a molded neoprene cup or 1/4-inch neoprene acoustical friction pad between baseplate and support.
2. Mountings shall have leveling bolts rigidly bolted to the Component.
3. Spring diameters shall be no less than 0.8 of compressed height of spring at rated load.
4. Springs shall have minimum additional travel to solid equal to 50 percent of rated deflection.
5. Product and Manufacturer: Provide one of the following:

    a. AB, manufactured by Vibration Mountings and Controls.
    b. SLF, manufactured by Mason Industries
    c. FDS, Kinetics Noise Control.
    d. Or approved equal.

B. Type B: Restrained Spring Isolator

1. Restrained spring mountings shall have Type A spring isolator within rigid housing that includes vertical limit stops to prevent spring extension when weight is removed. Housing shall serve as blocking during erection. Remove steel spacer after adjustment. Installed and operating heights are equal. Provide minimum clearance of 1/4-inch around restraining bolts and internal neoprene deceleration bushings to avoid interfering with spring action. Limit stops shall be out of contact during normal operation. Because housings shall be bolted or welded in position, provide an internal isolation pad.

2. Product and Manufacturer: Provide one of the following:

    a. ASCM, manufactured by Vibration Mountings and Controls.
    b. SLR, manufactured by Mason Industries.
    c. FLS, Kinetics Noise Control.
    d. Or approved equal.

C. Type C: Combination Spring/Elastomer Hanger Isolator (30-degree Type)

1. Hangers shall consist of rigid steel frames containing minimum 1.25-inch thick neoprene elements at top and steel spring with general characteristics specified for Type A. Neoprene element shall have neoprene bushings projecting through steel box.
2. Spring diameters and hanger box lower hole sizes shall be large enough to allow hanger rod to swing through a 30-degree arc from side to side before contacting rod bushing and short-circuiting the spring.
3. Submittals shall include hanger drawing showing 30-degree capabilities.
4. Hanger locations requiring pre-compression for holding piping at fixed elevation shall be pre-compressed by manufacturer.
5. Product and Manufacturer: Provide one of the following:

    a. HRSA, manufactured by Vibration Mountings and Controls.
    b. 30N, manufactured by Mason Industries.
    c. SRH, Kinetics Noise Control.
    d. Or approved equal.

D. Type D: Elastomer Double Deflection Hanger Isolator

1. Molded neoprene element, minimum 1.25-inch thick, with Projecting bushing lining rod clearance hole. Static deflection at rated load shall be minimum of 0.35 inches.
2. Steel retainer box encasing neoprene mounting capable of supporting Component up to four times rated capacity of element.
3. Product and Manufacturer: Provide one of the following:

    a. HR, manufactured by Vibration Mountings and Controls.
    b. HD, manufactured by Mason Industries.
    c. RH, Kinetics Noise Control.
    d. Or approved equal.

E. Type E: Combination Spring/Elastomer Hanger Isolator

1. Spring and neoprene elements in a steel retainer box with the features as specified in this Section for Type C and Type D isolators.
2. Hanger locations requiring pre-compression for holding piping at fixed elevation shall be pre-compressed by manufacturer.
3. Thirty-degree angularity feature is not required.
4. Product and Manufacturer: Provide one of the following:

    a. HRSA-PR, manufactured by Vibration Mountings and Controls.
    b. DNHS, manufactured by Mason Industries.
    c. SRPH, Kinetics Noise Control.
    d. Or approved equal.

F. Type F: Restrained Elastomer Floor Isolator

1. Neoprene mountings shall have minimum static deflection of 0.2 inches. Mount shall consist of two separated and opposing molded neoprene elements. Elements shall prevent central threaded sleeve and attachment bolt from contacting casting during normal operation. Shock absorbing neoprene materials shall be compounded to bridge-bearing specifications.
2. Product and Manufacturer: Provide one of the following:

    a. RSM, manufactured by Vibration Mountings and Controls.
    b. BR, manufactured by Mason Industries.
    c. RQ, Kinetics Noise Control.
    d. Or approved equal.

G. Type G: Pad Type Elastomer Isolator (Standard)

1. One layer of 3/4-inch thick neoprene pad consisting of two-inch square modules.
2. Use load distribution plates as required.
3. Provide bolting. Provide neoprene and duck washers and bushings to prevent short circuiting.
4. Product and Manufacturer: Provide one of the following:

    a. Maxiflex, manufactured by Vibration Mountings and Controls.
    b. Super W, manufactured by Mason Industries.
    c. RSP, Kinetics Noise Control.
    d. Or approved equal.

H. Type H: Pad Type Elastomer Isolator (High Density)

1. Laminated canvas duck and neoprene, minimum 1/2-inch thick, with loading capacity of 1,000 psi.
2. Use load distribution plate as required.
3. Bolting as required. Provide neoprene and duck washers and bushings to prevent short circuiting.
4. Product and Manufacturer: Provide one of the following:

    a. Fabriflex, manufactured by Vibration Mountings and Controls.
    b. HL, manufactured by Mason Industries.
    c. NDF, Kinetics Noise Control.
    d. Or approved equal.

I. Type I: Thrust Restraints

1. Spring element similar to that specified for Type A isolator shall be combined with steel angles, backup plates, threaded rod, washers, and nuts to produce a pair of devices capable of limiting movement of Components to 1/4-inch.
2. Restraint shall be easily converted in field from compression type to tension type.
3. Unit shall be factory pre-compressed.
4. Product and Manufacturer: Provide one of the following:

    a. RSHTR, manufactured by Vibration Mountings and Controls.
    b. WBI \ D, manufactured by Mason Industries.
    c. HSR, Kinetics Noise Control.
    d. Or approved equal.

J. Type J: Pipe Anchors

1. Provide all-directional acoustical pipe anchor, consisting of two sizes of steel tubing separated by minimum 1/2-inch thick 60-durometer neoprene.
2. Allowable loads on isolation material shall not exceed 500 psi. Balance design for equal resistance in all directions.
3. Product and Manufacturer: Provide one of the following:

    a. MDPA, manufactured by Vibration Mountings and Controls.
    b. ADA, manufactured by Mason Industries.
    c. KPA, Kinetics Noise Control.
    d. Or approved equal.

K. Type K: Pipe Guides

1. Pipe guides shall consist of telescopic arrangement of two sizes of steel tubing separated by minimum 1/2-inch thick 60-durometer neoprene.
2. Height of guides shall be pre-set with shear pin to allow vertical motion induced by pipe expansion and contraction. Shear pin shall be removable and re-insertable to allow selection of pipe movement.
3. Guides shall be capable of minimum 1-5/8-inch motion in both directions
4. Product and Manufacturer: Provide one of the following:

a. AG, manufactured by Vibration Mountings and Controls.
b. VSG, manufactured by Mason Industries.
c. KRQ, Kinetics Noise Control.
d. Or approved equal.

L. Type L: Isolated Pipe Hanger System

1. Provide pre-compressed spring and elastomer isolation hanger combined with pipe support into one assembly. Replaces standard clevis, single or double rod roller, or double rod fixed support.
2. Provide with spring element specified for Type A, with steel lower spring retainer and upper elastomer retainer cup with integral bushing to insulate support rod from isolation hanger.
3. Neoprene element under lower steel spring retainer shall have integral bushing to insulate support rod from steel spring retainer.
4. Design and construct hangers to support loads over three times the rated load without Failure.
5. System shall be pre-compressed to allow for rod insertion and standard leveling.
6. Product and Manufacturer: Provide one of the following:

a. CIH, CIR, TIH, PIH, manufactured by Vibration Mountings and Controls.
b. Mason Industries.
c. Kinetics Noise Control.
d. Or approved equal.

2.4 Restraint Types

A. Type I: Not used

B. Type II: Not used

C. Type III: Not used

D. Type IV: Floor or Roof Anchorage

1. Rigid attachment to structure utilizing wedge-type anchor bolts, anchored plates machine screw, bolting or welding. Powder shots are unacceptable.
2. Product and Manufacturer: Provide one of the following:

a. FA, manufactured by Vibration Mountings and Controls.
b. SAB, manufactured by Mason Industries.
c. KCAB, Kinetics Noise Control.
d. Or approved equal.

E. Type V: Cable Restraints

1. Cable Restraints shall consist of steel aircraft cables sized to resist loads with minimum safety factor of 2.0, and arranged to provide all directional restraint. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables shall not bend across sharp edges. Single arm braces with resilient bushings can be substituted for cable restraints. Deck fitting shall have two through-bolts for attachment.
2. Product and Manufacturer: Provide one of the following:

a. SCR, manufactured by Vibration Mountings and Controls.
b. SCB, manufactured by Mason Industries.
c. KSCU, Kinetics Noise Control.
d. Or approved equal.

2.5 Component Bases

A. General

1. All curbs and roof rails shall be anchored to building structural steel for resisting Lateral Forces. Fastening to metal deck is unacceptable.

B. Type B 1: Integral Structural Steel Base

1. Rectangular bases are preferred for all Components.
2. Centrifugal refrigeration machines and pump bases may be T- or L-shaped when there are space constraints. When the pump has pump-mounted suction and discharge fittings, base of pump shall include required supports.
3. All perimeter members shall be steel beams with minimum depth equal to 1/12 of the longest dimension of base.
4. Base depth need not exceed 12 inches provided that deflection and misalignment is within acceptable limits as determined by Supplier.
5. Height-saving brackets shall be employed on all mounting locations to provide minimum base clearance of two inches.
6. Product and Manufacturer: Provide one of the following:

a. WFB, manufactured by Vibration Mountings and Controls.
b. MSL, WSFL, manufactured by Mason Industries.
c. SFB, Kinetics Noise Control.
d. Or approved equal.

C. Type B 2: Concrete Inertia Base

1. Vibration isolation manufacturer shall furnish rectangular steel concrete pouring forms for floating and inertia foundations.
2. When pump has pump-mounted suction and discharge fittings, base of pump shall include required supports
3. Base depth shall be a minimum of 1/12 of the longest dimension of the base but not less than six inches.
4. Base depth need not exceed 12 inches unless specifically recommended by base manufacturer for mass or rigidity.
5. Forms shall include minimum concrete reinforcing consisting of 1/2-inch bars welded in place on six-inch centers running both ways in layer 1.5 inches above bottom.
6. Provide forms with steel templates to hold anchor bolts sleeves and anchors while concrete is poured.
7. Provide height-saving brackets on all mounting locations to maintain a two-inch minimum clearance below base.
8. Flush-profile wooden formed bases having correct depth and reinforcing requirements are acceptable.
9. Product and Manufacturer: Provide one of the following:

a. MPF, manufactured by Vibration Mountings and Controls.
b. BMK, manufactured by Mason Industries.
c. CIB, Kinetics Noise Control.
d. Or approved equal.

D. Type B 3: Wind Rated and Noise Reductive Spring Isolation Roof Curbs

1. Manufacturers:

a. Price Industries (Basis of Design)
b. Vibro-Acoustic Inc.
c. VAW
d. Or approved equal.

2. General:

a. The Contractor shall provide all labor, materials and equipment for the complete installation of the wind rated and noise reductive spring isolation roof curbs for all roof mounted Packaged, Direct Outside Air Units (DOAS-B, DOAS-1, DOAS-2, DOAS-3, DOAS-4).
b. The noise reductive spring isolation roof curbs, duct silencers and associated acoustic curb floor barrier panels shall be built complete by the noise control manufacturer as an integral unit.
c. If DOAS units other than those of the basis of design manufacturer are supplied on the project, the purchasing Contractor assumes full performance and project schedule for meeting the project noise criteria, including any retrofit work that may be required.
d. Upper frame shall provide continuous support for Component and be captive to resiliently resist Lateral Forces. Lower frame shall accept point support for both attachment and leveling. Upper frame shall provide positive fastening provisions (welding or bolting) to anchor roof top unit to curb. Sheet metal screws are unacceptable. Contact points between roof top unit, curb, and building's structure shall allow load path through those locations only.
e. All-directional neoprene snubber bushings shall be a minimum of 1/4-inch thick. Steel springs shall be laterally stable and rest on 1/4-inch thick neoprene acoustical pads.
f. The curb shall bear directly on the roof structure and shall be flashed and waterproofed into the roof's membrane waterproofing system by the installing contractor.
g. Curbs' waterproofing shall meet NRCA standards.
h. Curb-mounted rooftop Components shall be mounted on structural wind rated and noise reductive roof curbs.

3. Performance:

i. The noise reductive spring isolation curbs, duct silencers and associated acoustic curb floor barrier panels shall provide noise criteria of NC 30 for spaces directly under the DOAS units below the roof.
j. The noise control manufacturer shall provide the following acoustical and pressure drop calculations, as part of the submittal package complete with a stamp from a professional engineer licensed in New Jersey to demonstrate that the resultant noise

level in the indoor occupied space below the roof from DOAS-B, 1, 2, 3 & 4 shall meet the above noise criteria through the following noise paths:

1) Supply Air Noise
2) Return Air Noise
3) Duct Breakout Noise
4) Supply Air Pressure Drop Including System Effects
5) Return Air Pressure Drop Including System Effects

k. Acoustic floor barrier panels equivalent to Price AP4 model or approved equal shall meet or exceed the acoustic performance for DOAS-B,1,2,3,4 units in the table below:

Transmission Loss (TL) Values, dB:

Freq.	**63**	**125**	**250**	**500**	**1K**	**2K**	**4K**	**STC**
Transmission Loss	16	29	43	54	60	65	68	53

2. Construction:

a. Prefabricated structural acoustic roof curbs (as manufactured by Price Industries - Basis of Design)
   1) Coated steel sheet curb sections, corners fully mitered and welded; 1" x 4" pressure treated continuous wood nailer fastened at 12" on center to exterior of curb.
   2) Insulated with 2" x 1.5# density duct liner.
b. Profile height:
   1) Minimum 20 inches high as measured from top of roof membrane to top of curb.
c. Sheet metal gauge: To be determined by unit weight.
d. Isolation rail:
   1) Spring components shall be minimum 2" deflection, free-standing, unhoused, laterally stable steel springs. Springs shall have a lateral stiffness greater than 1.0 times the rated vertical stiffness and shall be designed for 50% overload to solid.
   2) Springs shall be color coded to indicate load capacity.
   3) Rails shall provide continuous support for the rooftop equipment and shall be designed to provide isolation against casing-radiated vibration in the rooftop equipment housing and structure borne vibration from rotating and mechanical equipment in the rooftop package.
   4) Rail assembly shall consist of extruded aluminum top and bottom members connected by spring isolators and a continuous air- and water-tight seal. The seal shall be a beaded elastomeric material retained in a keyway along the top extrusion. The weather strip shall be sealed along the bottom with an aluminum fascia strip.

5) Rail assemblies shall incorporate means for attachment to the building and the supported equipment and shall incorporate additional stiffening members if necessary to assure stability.
6) Vibration isolator shall be selected by the manufacturer for each specific application to comply with deflection requirements as shown in this specification below.

3. Acoustic barrier panels Price AP4 model (for the DOAS-B,1,2,3,4):
   a. Acoustic barrier panels shall be tongue and groove construction, four-inch depth, and shall consist of:
      1) 16 gauge solid galvanized G90 skin
      2) 16 gauge solid galvanized G90 liner
      3) 16 gauge full depth splitters spaced a maximum of 16 inches apart
      4) Absorptive acoustic mineral wool media
   b. Acoustic media:
      1) Media shall be packed with a minimum of 10% compression to eliminate voids and settling.
   c. Fire-Performance Characteristics:
      1) Acoustic barrier panel assemblies, including acoustic media fill, sealants, and acoustical spacers shall have combustion rating equal to or less than shown below when tested according to ASTM E84, NFPA 255 or UL 723:
      2) Flame-spread index not exceeding 25
      3) Smoke-developed index not exceeding 50
      4) Fire-Performance Characteristics:
         a) Acoustic barrier panel assemblies, including acoustic media fill, sealants, and acoustical spacers shall have combustion rating equal to or less than shown below when tested according to ASTM E84, NFPA 255 or UL 723:
            1) Flame-spread index not exceeding 25
            2) Smoke-developed index not exceeding 50

4. Duct silencers:
   a. General:
      1) Silencers shall be of the size, configuration, capacity and acoustic performance as scheduled on the drawings. Silencers shall be fabricated by the same manufacturer.
      2) Silencer inlet and outlet connection dimensions must be equal to the shown sizes on the drawings. Duct transitions at silencers are not permitted unless shown on the contract drawings.
   b. Construction:
      1) Silencers shall be constructed in accordance with ASHRAE and SMACNA Standards for the pressure and velocity classification specified for the air distribution system in which it is installed.
      2) Casing seams and joints shall be lock-formed and sealed or stitch welded and sealed except as noted, to provide leakage-resistant construction.
      3) Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.
      4) Perforated steel shall be adequately stiffened to insure flatness and form. Spot welds shall be painted as required.
      5) Fire-Performance Characteristics:

a) Silencer assemblies, including acoustic media fill, natural cotton fiber, sealants and acoustical spacers shall have Class 1 flame spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E84, NFPA 255 or UL 723.

6) Material gauge thickness:
   a) Material gauges noted in other sections are minimums and shall increase as required for the system pressure and velocity classification.
   b) The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.

c. Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel, gauge as listed below
   1) Rectangular Silencers, including STC-rated models: 22 gauge
   2) Rectangular Elbow Silencers: 22 gauge
   3) Transitional Silencers: 22 gauge

d. Rectangular Elbow Silencers:
   1) Acoustical splitter/baffles shall be internally radiused and aerodynamically designed for efficient turning of the air.
   2) Transitional Silencers:
      a) Transitioning shall occur internal to the silencer such that the height of the gap or air passage is changing with the length of the splitters/baffles.

e. Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel, gauge as listed below
   1) Rectangular Silencers, including STC-rated models: 22 gauge
   2) Rectangular Elbow Silencers: 22 gauge
   3) Transitional Silencers: 22 gauge

f. Principal Sound-Absorbing Mechanism as determined by the silencer manufacturer to achieve the required noise reduction.

g. Shipping Protection:
   1) Silencers shall be shipped with factory-installed end caps

5. All acoustic installation hardware shall be provided by the isolation curb manufacturer.

E. Type B 4: Not used

F. Type B 5: Isolated Component Supports

1. Continuous structural Component support aluminum rails minimum 14” high that combine Component support and spring isolation mounting into one utilized roof flashed assembly with same features specified for Type B-3.
2. System shall provide for positive anchorage or welding of Component to supports and welding of supports to building steel.
3. Product and Manufacturer: Provide one of the following:

   a. R7200/R7300, manufactured by Vibration Mountings and Controls.
   b. RSR, manufactured by Mason Industries.
   c. KSR, Kinetics Noise Control.
   d. Or approved equal.

G. Type B 6: Non-Isolated Component Supports

1. Shall be as specified for Type B-5, except without spring isolation.
2. Product and Manufacturer: Provide one of the following:

   a. R7000, manufactured by Vibration Mountings and Controls.
   b. RRC, manufactured by Mason Industries.
   c. Kinetics Noise Control.
   d. Or approved equal.

H. Type B 7: Control/Electric Room Air Conditioning Unit Base

1. Components shall be welded or bolted to welded structural steel stands having minimum 0.5 "G" certified lateral acceleration capabilities.
2. Non-Isolated stand shall have one inch adjustment capability to accommodate floor irregularities.
3. Bolting or welding required.
4. Product and Manufacturer: Provide one of the following:

   a. CRC, manufactured by Vibration Mountings and Controls.
   b. CRMSL, manufactured by Mason Industries.
   c. CRFS, Kinetics Noise Control.
   d. Or approved equal.

2.6 Flexible Connectors

A. Type FC 2: Flexible Stainless Steel Hose

1. Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes three-inch diameter and larger shall be flanged. Smaller sizes shall have male nipples.
2. Connector shall be braided bronze for refrigerant connections.

   a. Minimum lengths shall be as tabulated:

Flanged: diameter x length (inches)		**Male Nipples: diameter x length (inches)**	
3 x 14	10 x 26	0.5 x 9	1.5 x 13
4 x 15	12 x 28	0.75 x 10	2 x 14
5 x 19	14 x 30	1 x 11	2.5 x 18
6 x 20	16 x 32	1.25 x 12	
8 x 22			

3. Provide hoses on Component side of shut-off valves horizontally and parallel to Component shafts, where possible.
4. Product and Manufacturer: Provide one of the following:

a. BS, manufactured by Vibration Mountings and Controls.
b. MN/FFL, manufactured by Mason Industries.
c. BFMC, Kinetics Noise Control.
d. Or approved equal.

2.7 Materials Of Construction And Finishes

A. Controls including all miscellaneous structural steel and appurtenances shall be constructed of galvanized steel area served by heating and ventilating units located in non-corrosive areas.

B. Controls shall be factory-painted per Section 099123, Painting and Coating.

C. Miscellaneous steel angles, supports, and appurtenances shall be cleaned and prime-coated in the shop and field-painted per Section 099123, Painting and Coating.

D. Hardware in non-corrosive areas shall be galvanized steel.

E. Neoprene and elastomer parts shall be resistant to ultraviolet radiation and constructed from high grade materials suitable for exposure to high concentrations of hydrogen sulfides, mercaptans, chlorine, and moisture in air.

2.8 Identification

A. Provide each Control device with Type 316 stainless steel tag embossed or engraved with serial number cross-referenced to Component schedule, in accordance with Section 230553 - Identification for HVAC Piping and Equipment.

2.9 Miscellaneous Metal

A. Miscellaneous metal fabrications shall be per Section 05 50 00 - Metal Fabrications.

PART 3 - EXECUTION

3.1 Inspection

A. Examine areas and conditions under which Control Work is to be performed and notify Engineer in writing of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

B. Coordinate anchorage of Components to receive Controls with installation locations. Examine roughing-in of reinforcing and cast-in-place anchor bolts to verify locations before installation.

3.2 Component Installation

A. Install Controls in accordance with Supplier's written instructions and Shop Drawings and submittals accepted by Engineer.

B. Rigid connections between Components and building structure shall not be made in a manner that degrades performance of Control systems.

C. Do not rigidly connect Isolated Components to building structure.

D. Bracing may occur from flanges of structural beams, upper truss chords in bar joist construction, and concrete inserts or cast-in-place anchor bolts. Component support shall not overstress the structure.

E. Install cable restraints with minimum slack to avoid short-circuiting associated Component.

F. Install cable assemblies without slack on Non-Isolated systems. Solid braces may be used in place of cables on rigidly attached systems except where single arm braces incorporate resilient bushings.

G. At locations where restraints or solid braces are located, brace support rods as required to accept compressive loads.

H. Minimum operating clearance under all Isolated Component bases shall be two inches.

3.3 Field Quality Control

A. Controls Design Engineer Services:

1. Controls design engineer shall check controls installation before controls and related equipment are placed into operation.
2. Controls design engineer shall make at least one visit to the site.
3. After controls installation is complete, controls design engineer shall inspect completed controls work and certify in writing to contractor that all systems are installed in accordance with design. Contractor shall submit control design engineer's report to engineer, certifying correctness of the work.

B. Manufacturer's Services:

1. Manufacturer shall check Controls installation before Controls and related equipment are placed into operation.
2. Manufacturer representative shall make at least one visit to the Site.
3. After installation of Controls is complete, Manufacture's representative shall inspect completed Controls Work and certify in writing to Contractor that Controls are installed in accordance with Manufacturer's recommendations and Shop Drawings and submittals accepted by Engineer. Contractor shall submit Manufacturer's report to Engineer certifying correctness of the Work.

3.4 Adjusting

A. After entire system is started and under full operating load, adjust Controls so that Controls operate as designed.

3.5 Cleaning

A. Remove debris from beneath Components and in and around the vibration isolator.

3.6 SUPPLEMENTS

A. Supplements listed below, following the "End of Section" designation, are a part of this Section:

1. Controls Schedules:

a. Schedule of HVAC Components for Vibration Control.
b. Schedule of HVAC Components for Wind Control.
c. Schedule of Instrumentation Components for Vibration Control.

2. Controls Tables:

a. Table 23 05 48-A - HVAC System Components.
b. Table 23 05 48-B - Not Used.
c. Table 23 05 48-C - Not Used.
d. Table 23 05 48-D - Not Used.
e. Table 23 05 48-E – Not Used.
f. Table 23 05 48-F - Minimum Deflection Guide.

3. Attachment 23 05 48-A – Professional Design Services Performance Certification.

END OF SECTION 230548

CONTROLS SCHEDULES FOR SECTION 23 05 48

Section 23 05 48

Schedule of HVAC Components for Vibration Control

Item No.	Component	Notes
1	Packaged Direct Outside Air Supply Unit (DOAS-B, DOAS-1, DOAS-2, DOAS-3 & DOAS-4)	
2	Variable Refrigerant Flow (VRF) Outdoor units (ODU B-1, B-2, B-3, 1-1, 1-2, 2-1, 2-2, 3-1, 3-2, 4-1 & 4-2)	
3	Variable Refrigerant Flow (VRF) Indoor Units (IDU B-1 thru B-16, IDU 1-1 thru 1-14, IDU 2-1 thru 2-15, IDU 3-1 thru 3-15, IDU 4-1 thru 4-15)	
4	Computer Room Air Conditioning Unit (CRAC-B, 1, 2, 3, 4)	
5	Computer Room Remote Condensing Unit (CRACC-B, 1, 2, 3, 4)	
6	Fans (SF-B-1, EF-B-1 & 2, EF-1-1, 2-1, 3-1, 4-1 & 4-2)	
7	Split System Heat Pump Indoor Units (HP-1-1, 1-2, 2-1, 3-1, 4-1, R-1 & R-2)	
8	Split System Heat Pump Outdoor Units (HPCU-1-1, 1-2, 2-1, 3-1, 4-1, R-1 & R-2)	
9	Electric Unit Heater (EUH B-1, B-2, 1-1, 1-2, 1-3, 1-4, 1-5, 2-1, 3-1 & 4-1)	
10	VRF Heat Recovery Branch Controller (BC B-1, B-2m 1-1, 1-2, 2-1, 2-2, 3-1, 3-2, 4-1, 4-2)	
11		
12		
13		
14		
15		
16		
17		

NOTES: Vibration Controls shall be factory installed by the unit manufacturer in accordance with Section 23 05 48.

Section 23 05 48

Schedule of HVAC Systems for Wind Control

Item No.	Component	I_p	Certificate of Compliance Required	Notes
1	Packaged Direct Outside Air Supply Unit (DOAS-B, DOAS-1, DOAS-2, DOAS-3 & DOAS-4)			
2	Variable Refrigerant Flow (VRF) Outdoor units (ODU B-1, B-2, B-3, 1-1, 1-2, 2-1, 2-2, 3-1, 3-2, 4-1 & 4-2)			
3	Computer Room Remote Condensing Unit (CRACC-B, 1, 2, 3, 4)			
4	Fans (EF-B-1, EF-1-1, 2-1, 3-1, 4-1 & 4-2)			
5	Split System Heat Pump Outdoor Units (HPCU-1-1, 1-2, 2-1, 3-1, 4-1, R-1 & R-2)			
6	Penthouse Louver (PL-1)			
7				
8				
9				
10				

Section 23 05 48

Schedule of Instrumentation Components for Vibration Control

Item No.	Component	Notes
1	Vibration Controls are not required.	
2		
3		
4		
5		
6		
7		
8		
9		
10		

SECTION 23 05 48 TABLES

Abbreviations for Tables 23 05 48-A, 23 05 48-B, 23 05 48-C, and 23 05 48-D:

ISOL Vibration Isolator

DEFL Deflection

RESTR Restraint

MTNG Mounting

MDG Minimum Deflection Guide – Table 23 05 48-F

General Notes (G) for Tables 23 05 48-A, 23 05 48-B, 23 05 48-C, and 23 05 48-D:

Note G1: For variable speed Components with an operating speed below 600 rpm, select isolation deflection from Table 23 05 48-F, Minimum Deflection Guide.

Note G2: Determine static deflection based on Table 23 05 48-F, Minimum Deflection Guide.

Note G3: Deflections indicated are minimum at actual load and shall be selected for Supplier's nominal 5-, 4-, 3-, 2- and 1-inch deflection spring series; rpm is defined as lowest operating speed of Component.

Note G4: Single stroke compressors may require inertia bases with thickness greater than 14-inch maximum specified for Base B-2. Inertia base mass shall be sufficient to maintain double amplitude for 1/8-inch.

Note G4: For floor-mounted fans, substitute base Type B-2 for Class 2 or 3 and fan having static pressure over five inches of water column.

Note G5: Indoor utility sets with wheel diameters less than 24 inches need not have deflections greater than 0.75 inches.

Note G6: For Components with multiple motors, horsepower classification applies to largest single motor.

Reference Notes (R) for Tables 23 05 48-A, 23 05 48-B, 23 05 48-C, and 23 05 48-D:

Note R1: For roof applications, use base Type B-5.

Note R2: No used

Note R3: The roof curbs shall be noise reductive acoustic type curbs provided by the Contractor (See Type B-3 Wind Rated Curb in Paragraph 2.5 of this Section.)

Note R4: Not used

Note R5: Not used

Note R6: Not used

TABLE 23 05 48-A - HVAC SYSTEM COMPONENTS						
			Mounted on Suspended Slab and Floor or Roof System			
COMPONENT	HP, CLASS, OR SIZE	MTNG	ISOL	DEFL (in.)	BASE	RESTR
Air Cooled Condensing Units, VRF Outdoor Units (all ODU units per schedule on DWG. M701), CRACC-B,1,2,3,4, HPCU-1-1,1-2,2-1,3-1,4-1, R-1,R-2)		Roof	B	2.50 (minimum)	B-5	IV
Fans, Indoor (see DWG. M700)	To 1 HP	Clg	B	0.75	---	IV
		Clg	E	0.75	---	V
	>1 HP	Clg	B	See MDG	---	IV
		Clg	E	See MDG	---	V
Computer Room Units (CRAC-B,1,2,3,4)		Flr	B	1.5	B-7	IV

TABLE 23 05 48-A - HVAC SYSTEM COMPONENTS (Continued)						
			Mounted on Suspended Slab and Floor or Roof System			
COMPONENT	**HP, CLASS, OR SIZE**	**MTNG**	**ISOL**	**DEFL (in.)**	**BASE**	**RESTR**
Packaged, Direct Outside Air Units (DOAS-B,1,2,3,4 units)	< 10 Ton	Roof	B	2.00	B-3, See note R3	IV
	> 10 Ton	Roof	B	2.50	B-3, See note R3	IV
Electric Unit Heaters (EUH units, See DWG. M700), VRF Heat Recovery Branch Controller (see BC units on DWG. M701)		Clg	D	0.30	---	V
Split System Heat Pump, Indoor (HP-1-2), VRF Indoor Units (IDU units per schedule on DWG. M701)		Clg	D	0.30	---	V

Table 23 05 48-F – MINIMUM DEFLECTION GUIDE	
rpm	**MINIMUM REQUIRED DEFLECTION (inches)**
Less than 400	3.5
401 to 600	2.5
601 to 900	1.5
Over 900	0.75

ATTACHMENT 230548-A

Professional Design Services Performance Certification

1. My name is _____.

2. My New Jersey professional engineering/architecture license number is _____.

3. My license expires _____, 20_____.

4. The Project for which I have performed professional design services is described as_____.

5. The Specification Section(s) under which I have performed my services is/are _____.

6. The name and address of the individual or entity for whom I have performed professional design services is:

_____
_____
_____
_____

7. I hereby certify that, to the best of my knowledge, information, and belief, I have performed or supervised performance of the professional design services hereunder, and that said services have been performed in accordance with Laws and Regulations and in accordance with the standard of care currently expected of professional engineers/architects performing similar services for Projects of similar size and complexity in New Jersey.

_____ _____

Date Signature

_____

Type or Print Name

_____

Name of Firm

_____

Street Address

[PROFESSIONAL SEAL]

_____

City/State/Zip Code

Telephone: _____ Fax: _____

END OF SECTION 230548

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Labels and Tags:
1. Schedule for all equipment labels and tags shall be submitted to Owner for review and approval.
2. Schedule shall include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 COLORS

A. The colors listed in this section are generic colors to be used in the absence of site specific color guidelines. The contractor is responsible coordinate new colors with the existing color schemes in use.

2.2 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, or approved equal following:

    a. Brimar Industries, Inc.
    b. Craftmark Pipe Markers.
    c. Seton Identification Products.
    d. Or approved equal

2. Material and Thickness: aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Letter Color: Black.
4. Background Color: White.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.3 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, or approved equal following:
1. Brimar Industries, Inc.
2. Craftmark Pipe Markers.
3. Seton Identification Products.
4. Or approved equal.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: Red.

D. Background Color: Yellow.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.4 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, or approved equal following:

1. Brimar Industries, Inc.
2. Craftmark Pipe Markers.
3. Seton Identification Products.
4. Or approved equal.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.5 DUCT LABELS

A. Manufacturers: Subject to compliance with requirements, or approved equal following:

1. Brimar Industries, Inc.
2. Craftmark Pipe Markers.
3. Seton Identification Products.
4. Or approved equal.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: White.

D. Background Color: Blue.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

2.6 STENCILS

A. Stencils for Piping:

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:
   a. Brimar Industries, Inc.
   b. Craftmark Pipe Markers.
   c. Seton Identification Products.
   d. Or approved equal.

2. Lettering Size: Size letters according to ASME A13.1 for piping.
3. Stencil Material: Aluminum.
4. Stencil Paint: Exterior, gloss, alkyd enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

B. Stencils for Ducts:

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:
   a. Brimar Industries, Inc.

b. Craftmark Pipe Markers.
c. Seton Identification Products.
d. Or approved equal.

2. Lettering Size: Minimum letter height of 1-1/4 inches for viewing distances up to 15 feet and proportionately larger lettering for greater viewing distances.

3. Stencil Material: Aluminum.
4. Stencil Paint: Exterior, gloss, alkyd enamel. Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, alkyd enamel. Paint may be in pressurized spray-can form.

C. Stencils for Access Panels and Door Labels, Equipment Labels, and Similar Operational Instructions:

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:
   a. Brimar Industries, Inc.
   b. Craftmark Pipe Markers.
   c. Seton Identification Products.
   d. Or approved equal.

2. Lettering Size: Minimum letter height of 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.
3. Stencil Material: Aluminum.
4. Stencil Paint: Exterior, gloss, alkyd enamel. Paint may be in pressurized spray-can form.
5. Identification Paint: Exterior, alkyd enamel. Paint may be in pressurized spray-can form.

2.7 VALVE TAGS

A. Manufacturers: Subject to compliance with requirement, or approved equal the following:

1. Brimar Industries, Inc.
2. Craftmark Pipe Markers.
3. Seton Identification Products.
4. Or approved equal.

B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: stainless steel, 0.025-inch aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain or S-hook.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.8 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, or approved equal the following:

1. Brimar Industries, Inc.
2. Craftmark Pipe Markers.
3. Seton Identification Products.
4. Or approved equal.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Reinforced grommet and wire or string.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety-yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Piping Color Coding: Painting of piping is specified in the 09 Painting specifications.

B. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

D. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

E. Pipe Label Color Schedule:
1. Heating Water Piping: White letters on a safety-green background.
2. Refrigerant Piping: White letters on a safety-gray background.

3.5 DUCT LABEL INSTALLATION

A. Install plastic-laminated duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

B. Stenciled Duct Label Option: Stenciled labels showing service and flow direction may be provided instead of plastic-laminated duct labels, at Installer's option.

C. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose

connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Refrigerant: 2 inches, round.
b. Hot Water: 2 inches, round.
c. Gas: 2 inches, round.

2. Valve-Tag Colors:

a. Toxic and Corrosive Fluids: Black letters on a safety-orange background.
b. Flammable Fluids: Black letters on a safety-yellow background.
c. Combustible Fluids: White letters on a safety-brown background.
d. Potable and Other Water: White letters on a safety-green background.
e. Compressed Air: White letters on a safety-blue background.
f. Defined by User: White letters on a safety-purple background, black letters on a safety-white background, white letters on a safety-gray background, and white letters on a safety-black background

3.7 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:
    a. Constant-volume air systems.
    b. Variable-air-volume systems.
2. Testing, Adjusting, and Balancing Equipment:
    a. Motors.
    b. Condensing units.
    c. Heat-transfer coils.
3. Sound tests.
4. Vibration tests.
5. Duct leakage tests.
6. Control system verification.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TABB: Testing, Adjusting, and Balancing Bureau.

F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

G. TDH: Total dynamic head.

1.4 PREINSTALLATION MEETINGS

A. TAB Conference: Conduct a TAB conference at Project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.

1. Minimum Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Needs for coordination and cooperation of trades and subcontractors.
d. Proposed procedures for documentation and communication flow.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. System Readiness Checklists: Within 60 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.

E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.

F. Certified TAB reports.

G. Sample report forms.

H. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.6 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC or NEBB.

1. TAB specialists may not have any affiliation with the any contractor or manufacturer performing work or supplying equipment or services to the project.

2. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC or NEBB.
3. TAB Technician: Employee of the TAB specialist and certified by AABC or NEBB as a TAB technician.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.7 FIELD CONDITIONS

A. Full Owner Occupancy: All HVAC systems shall be tested, adjusted and balanced prior to owner occupancy.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment

performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

K. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine operating safety interlocks and controls on HVAC equipment.

N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default setpoints if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
b. Duct systems are complete with terminals installed.
c. Volume, smoke, and fire dampers are open and functional.
d. Clean filters are installed.
e. Fans are operating, free of vibration, and rotating in correct direction.
f. Variable-frequency controllers' startup is complete and safeties are verified.
g. Automatic temperature-control systems are operational.
h. Ceilings are installed.
i. Windows and doors are installed.
j. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
   1. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
   2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation" and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:

a. Measure static pressure directly at the fan outlet or through the flexible connection.
b. Measure static pressure directly at the fan inlet or through the flexible connection.
c. Measure static pressure across each component that makes up the air-handling system.
d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, sub-main ducts, and major branch ducts to indicated airflows.

1. Measure airflow of sub-main and branch ducts.
2. Adjust sub-main and branch duct volume dampers for specified airflow.
3. Re-measure each sub-main and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Adjust the variable-air-volume systems as follows:

1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
2. Verify that the system is under static pressure control.
3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:

    a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
    b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
    c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
    d. Adjust controls so that terminal is calling for minimum airflow.
    e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
    f. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.

5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
    c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.

d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

6. Measure fan static pressures as follows:

a. Measure static pressure directly at the fan outlet or through the flexible connection.
b. Measure static pressure directly at the fan inlet or through the flexible connection.
c. Measure static pressure across each component that makes up the air-handling system.
d. Report any artificial loading of filters at the time static pressures are measured.

7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
b. Verify that terminal units are meeting design airflow under system maximum flow.

8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.
9. Verify final system conditions as follows:

a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
b. Re-measure and confirm that total airflow is within design.
c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
d. Mark final settings.
e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
f. Verify tracking between supply and return fans.

3.7 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.8 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record fan and motor operating data.

3.9 DUCT LEAKAGE TESTS

A. Witness the duct pressure testing performed by Installer.

B. Verify that proper test methods are used and that leakage rates are within specified tolerances.

C. Report deficiencies observed.

3.10 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify temperature control system is operating within the design limitations.
2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.
4. Verify that controller set points are as indicated.
5. Verify the operation of lockout or interlock systems.
6. Verify the operation of valve and damper actuators.
7. Verify that controlled devices are properly installed and connected to correct controller.
8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.11 TOLERANCES

A. Set HVAC system's airflow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.12 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems

balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.13 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans performance forms including the following:

a. Settings for outdoor-, return-, and exhaust-air dampers.
b. Conditions of filters.
c. Face and bypass damper settings at coils.
d. Fan drive settings including settings and percentage of maximum pitch diameter.
e. Settings for supply-air, static-pressure controller.
f. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Pipe and valve sizes and locations.
4. Terminal units.
5. Balancing stations.
6. Position of balancing devices.

E. Units Test Reports: For air-handling units include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Outdoor airflow in cfm.
g. Exhauust airflow in cfm.
h. Outdoor-air damper position.

i. Dampers position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Refrigerant expansion valve and refrigerant types.
i. Refrigerant suction pressure in psig.
j. Refrigerant suction temperature in deg F.

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

I. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.14 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.

B. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

E. If TAB work fails, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
3. If the second verification also fails, Architect may contact AABC Headquarters regarding the AABC National Performance Guaranty.

F. Prepare test and inspection reports.

3.15 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed return located in unconditioned space.
3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
4. Indoor, exposed supply and outdoor air.
5. Indoor, exposed return located in unconditioned space.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

B. Related Sections:

1. Section 230719 "HVAC Piping Insulation."
2. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation

materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

1. Ductwork Mockups:

a. One 10-foot section each of rectangular and round straight duct.
b. One each of a 90-degree mitered round and rectangular elbow, and one each of a 90-degree radius round and rectangular elbow.
c. One rectangular branch takeoff and one round branch takeoff from a rectangular duct. One round tee fitting.
d. One rectangular and round transition fitting.
e. Four support hangers for round and rectangular ductwork.
f. Each type of damper and specialty.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Obtain Architect's approval of mockups before starting insulation application.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type II with factory-applied vinyl

jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article. Minimum value of R-6 for indoor and R-8 for outdoor duct or plenums.

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:

    a. CertainTeed Corporation.
    b. Johns Manville; a Berkshire Hathaway company.
    c. Knauf Insulation.
    d. Owens Corning.
    e. Or approved equal.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article. Minimum value of R-6 for indoor and R-8 for outdoor duct or plenums.

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:

    a. CertainTeed Corporation.
    b. Johns Manville; a Berkshire Hathaway company.
    c. Knauf Insulation.
    d. Owens Corning.
    e. Or approved equal

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Foster Brand; H. B. Fuller Construction Products.
    d. Or approved equal

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:

    a. Dow Corning Corporation.
    b. Johns Manville; a Berkshire Hathaway company.
    c. P.I.C. Plastics, Inc.
    d. Or approved equal

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:

    a. Foster Brand; H. B. Fuller Construction Products.
    b. Knauf Insulation.
    c. Vimasco Corporation.
    d. Or approved equal

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Foster Brand; H. B. Fuller Construction Products.
    d. Or approved equal

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.

4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Foster Brand; H. B. Fuller Construction Products.
   c. Knauf Insulation.
   d. Or approved equal

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Manufacturers: Subject to compliance with requirements, or approved equal the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Foster Brand; H. B. Fuller Construction Products.
   c. Vimasco Corporation.
   d. Or approved equal

3. Service Temperature Range: 0 to plus 180 deg F.
4. Color: White.

2.5 SEALANTS

A. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:

   a. Childers Brand; H. B. Fuller Construction Products or approved equal.
   b. Eagle Bridges - Marathon Industries.
   c. Foster Brand; H. B. Fuller Construction Products.
   d. Or approved equal

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Manufacturers: Subject to compliance with requirements, or approved equal the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. P.I.C. Plastics, Inc.
    c. Proto Corporation.
    d. Or approved equal

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Manufacturers: Subject to compliance with requirements, or approved equal of the following:

    a. Ideal Tape Co., Inc., an American Biltrite Company.
    b. Knauf Insulation.
    c. Venture Tape.
    d. Or approved equal

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Manufacturers: Subject to compliance with requirements, or approved equal of the following:

    a. Compac Corporation.
    b. Ideal Tape Co., Inc., an American Biltrite Company.
    c. Venture Tape.
    d. Or approved equal

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

2.9 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, or approved equal of the following:

    a. ITW Insulation Systems; Illinois Tool Works, Inc.
    b. RPR Products, Inc.
    c. Venture Tape.
    d. Or approved equal

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

a. Manufacturers: Subject to compliance with requirements, or approved equal of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Hardcast, Inc.
4) Midwest Fasteners, Inc.
5) Or approved equal

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

a. Manufacturers: Subject to compliance with requirements, or approved equal of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Hardcast, Inc.
4) Midwest Fasteners, Inc.
5) Or approved equal

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Manufacturers: Subject to compliance with requirements, or approved equal of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Midwest Fasteners, Inc.
4) Or approved equal

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

c. Spindle: Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Manufacturers: Subject to compliance with requirements, or approved equal of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Hardcast, Inc.
4) Midwest Fasteners, Inc.
5) Or approved equal

b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.

c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.

d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Manufacturers: Subject to compliance with requirements, or approved equal of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Hardcast, Inc.
4) Midwest Fasteners, Inc.
5) Or approved equal

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

c. Spindle: Stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

d. Adhesive-backed base with a peel-off protective cover.

6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Manufacturers: Subject to compliance with requirements, or approved equal of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Hardcast, Inc.
4) Midwest Fasteners, Inc.
5) Or approved equal

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Manufacturers: Subject to compliance with requirements, or approved equal of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Hardcast, Inc.
4) Midwest Fasteners, Inc.
5) Or approved equal

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, or approved equal of the following:
   a. C & F Wire
   b. ACS Industries, INC
   c. ITW Insulation Systems;
   d. Or approved equal

2.10 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping" - Firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in the 09 Painting specifications.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply air.
2. Indoor, concealed supply and outdoor air located in unconditioned space.
3. Indoor, concealed return and exhaust located in unconditioned space.
4. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
5. Indoor, exposed supply air.
6. Indoor, exposed outdoor air located in unconditioned space.
7. Indoor, exposed return located in unconditioned space.
8. Indoor, exposed exhaust located in unconditioned space.

9. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Factory-insulated plenums and casings.
2. Flexible connectors.
3. Vibration-control devices.
4. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, rectangular or round, supply-air and outdoor air duct insulation:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

B. Concealed, rectangular, return or exhaust-air duct insulation in unconditioned spaces:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

C. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be the following:

1. Mineral-Fiber Blanket: 3 inches thick and 1.5-lb/cu. ft. nominal density.

D. Exposed, rectangular, supply and outdoor air duct insulation:

1. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

E. Exposed, rectangular, return or exhaust-air duct insulation in unconditioned spaces:

1. Mineral-Fiber Board: 2 inches thick and 2-lb/cu. ft. nominal density.

F. Exposed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density.

3.11 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.

D. Ducts and Plenums, Exposed:

1. Painted PVC: 30 mils thick.
2. Color shall be selected by Architect.

END OF SECTION 230713

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Condensate drain piping, indoors.
2. Refrigerant suction and hot-gas piping, indoors and outdoors.

B. Related Sections:

1. Section 230713 "Duct Insulation."

2. Section 232300 “Refrigerant Piping”

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General" and "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Manufacturers: Subject to compliance with requirements, provide products by the following, or approved equal:
   a. Armacell LLC.
   b. K-Flex
   c. Aeroflex USA, Inc
   d. Or approved equal

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

   a. Johns Manville; a Berkshire Hathaway company.
   b. Knauf Insulation.
   c. Owens Corning
   d. Or approved equal.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Manufacturers: Subject to compliance with requirements, provide products by the following or approved equal:
   a. Ramco Insulation, Inc.
   b. GLT Products
   c. Eager-Picher Industries, Inc
   d. Or approved equal

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Ramco Insulation, Inc. or approved equal.
   b. BNZ Materials, INC.
   c. Hylo Insulating Cement
   d. Or approved equal

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Manufacturers: Subject to compliance with requirements, provide products by the following or approved equal:
   a. Ramco Insulation, Inc.
   b. Johns Manville
   c. Eager-Picher Industries, Inc
   d. Or approved equal

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:

   a. Aeroflex USA, Inc.
   b. Armacell LLC.
   c. Foster Brand; H. B. Fuller Construction Products.
   d. Or approved equal

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

a. Childers Brand; H. B. Fuller Construction Products.
b. Eagle Bridges - Marathon Industries.
c. Foster Brand; H. B. Fuller Construction Products.
d. Or approved equal

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

a. Childers Brand; H. B. Fuller Construction Products.
b. Eagle Bridges - Marathon Industries.
c. Foster Brand; H. B. Fuller Construction Products.
d. Or approved equal

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

a. Dow Corning Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. P.I.C. Plastics, Inc.
d. Or approved equal

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

a. Foster Brand; H. B. Fuller Construction Products.
b. Knauf Insulation.
c. Vimasco Corporation.
d. Or approved equal

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

a. Childers Brand; H. B. Fuller Construction Products.
b. Eagle Bridges - Marathon Industries.
c. Foster Brand; H. B. Fuller Construction Products.
d. Or approved equal

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

a. Childers Brand; H. B. Fuller Construction Products.
b. Eagle Bridges - Marathon Industries.
c. Foster Brand; H. B. Fuller Construction Products.
d. Or approved equal

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Knauf Insulation.
    d. Or approved equal

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Vimasco Corporation.
    d. Or approved equal

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Foster Brand; H. B. Fuller Construction Products.
    d. Pittsburgh Corning Corporation.
    e. Or approved equal

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.

4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Foster Brand; H. B. Fuller Construction Products.
    d. Or approved equal

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Johns Manville
    c. Vimasco Corporation.
    d. or approved equal.

B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

a. Foster Brand; H. B. Fuller Construction Products.
b. Vimasco Corporation.
c. Johns Manville
d. or approved equal.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
a. Alpha Associates, In.
b. Childers Brand; H. B. Fuller Construction Products.
c. Vimasco Corporation.
d. or approved equal.

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

a. Johns Manville; a Berkshire Hathaway company.
b. P.I.C. Plastics, Inc.
c. Proto Corporation
d. Speedline Corporation.
e. Or approved equal

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
4. PVC jackets are available in several colors. Colored jackets may be used to replace field painting. UV rays fade colors in exterior applications. Some colors (black, gray, and white) do not fade as quickly as other colors (red, orange, and green). Colored jackets have different emissivity and are not recommended for outdoor use.
5. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Self-Adhesive Outdoor Jacket: 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross laminated polyethylene film covered with white aluminum-foil facing.

1. Manufacturers: Subject to compliance with requirements, provide products by the following. or approved equal.:

a. Polyguard Products, Inc
b. P.I.C. Plastics, Inc.
c. Proto Corporation
d. Or approved equal

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

a. ABI, Ideal Tape Co., Inc.
b. Avery Dennison Corporation
c. Venture Tape.
d. Or approved equal

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

a. Compac Corporation.
b. ABI, Ideal Tape Co.
c. Venture Tape.
d. Or approved equal

2. Width: 2 inches.
3. Thickness: 6 mils.

4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

   a. ABI, Ideal Tape Division;
   b. Avery Dennison Corporation, Specialty Tapes Division;
   c. Compac Corporation;
   d. Venture Tape;
   e. Or approved equal

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:

   a. ITW Insulation Systems; Illinois Tool Works, Inc.
   b. RPR Products, Inc.
   c. Dow Chemical Company (The)
   d. Or approved equal

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. C & F Wire
   b. ACS Industries, INC
   c. ITW Insulation Systems;
   d. Or approved equal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.9 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be:

a. Flexible Elastomeric: 1 inch thick
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch

B. Refrigerant Suction and Hot-Gas Piping 190 Deg. F:

1. All Pipe Sizes: Insulation shall be:

a. Flexible Elastomeric: 1.5 inch thick.

C. Refrigerant Suction and Hot-Gas Flexible Tubing 190 Deg. F:

1. All Pipe Sizes: Insulation shall be:

a. Flexible Elastomeric: 1.5 inch thick.

3.12 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping190 Deg. F:

1. All Pipe Sizes: Insulation shall be:

a. Flexible Elastomeric: 1.5 inch thick.

B. Refrigerant Suction and Hot-Gas Flexible Tubing 190 Deg. F:

1. All Pipe Sizes: Insulation shall be:

a. Flexible Elastomeric: 1.5 inch thick.

3.13 PIPE INSULATION THICKNESS TABLE:

Minimum Pipe Insulation Thickness (in. inches)

FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F)	Insulation Conductivity		Nominal Pipe or Tube Size (inches)				
	Conductivity Btu*in./(h*ft*° F)	Mean Rating Temperature, °F	¾ & less	1 to 1-1/4	1-1/2 to 3	4 to 7	8 & larger
> 350	0.32 – 0.34	250	4.5	5.0	5.0	5.0	5.0
251 – 350	0.29 – 0.32	200	3.0	4.0	4.5	4.5	4.5
201 – 250	0.27 – 0.30	150	2.5	2.5	3.0	3.0	3.0
141 – 200	0.25 – 0.29	125	1.5	1.5	2.0	2.0	2.0
105 – 140	0.21 – 0.28	100	1.5	1.5	1.5	1.5	1.5
40 – 60	0.21 – 0.27	75	1.5	1.5	1.5	1.5	1.5

< 40	0.20 – 0.26	50	1.0	1.0	1.0	1.0	1.5

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. All Piping, Concealed:

1. None.

C. All Piping, Exposed:

1. Painted, PVC: 30 mils thick.
2. Color: Final color as selected by Architect.

3.15 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. All Piping:

1. PVC: 30 mils thick.

END OF SECTION 230719

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 230900 - DIRECT DIGITAL CONTROLS (DDC) SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

1. Section Includes:
    1. This section describes the Building Automation System (BAS) and associated DDC systems required for the project. The DDC equipment located in the building (shown on the controls riser diagram) shall integrate to the Trane Tracer SC as part of the project.

    2. The BAS system for the project consists of (1) Operator Work Station, (1) Trane Tracer SC network panel, (5) DOASs with factory mounted BACnet controllers, (5) VRF System controllers (TE-200 or TW-50 control panels), CRAC units, Heat pumps, Exhaust Fans, Supply Fans, VAVs, and other miscellaneous equipment as shown on the drawings. The BAS and all systems associated with the BAS must adhere to the sequence of operations.

    3. The BAS shall be web based permitting access by multiple operators simultaneously using standard web-based browser software. The Owner is to provide (6) coordinated LAN network drops as well as static IP addresses for implementation of BAS: (1) BMS panel drop, and (5) VRF control panel drops (TE-200 or TW-50 control panels). The bidder is to coordinate Local Area Network access points with the Owner's IT personnel. BAS system access shall be password protected and contain software fire wall protections as to not affect the Owner's LAN. Server shall communicate with the DDC systems utilizing BACnet MSTP (native), BACnet/Zigbee (wireless if approved by owner) and BACnet/IP open communication protocols that are certified and comply with all ASHRAE standard 135 requirements. BAS System must be BACnet top to bottom. Tridium products will not be acceptable.

    4. DDC systems and associated DDC controllers shall be certified BACnet MSTP, BACnet/Zigbee, or BACnet/IP communicating devices and shall not utilize any proprietary communication protocols.

1.3 SYSTEM SCOPE OF WORK

1. GENERAL

    1. Provide integration of all equipment, controls, monitored points, and alarms to the BAS (located in building) as specified within this section. The Owner shall be able to override, control, monitor, and alarm all connected points and ALL costs associated with this

integration are to be included within this bid. (Refer to construction documents and drawing)

a. DOASs
b. VRF Systems
    1) VRF systems are tied into a total of (5) VRF System Controllers [TE-200 or TW-50 control panels].
    2) Auxiliary Heat interlock [if applicable]
c. Heat Pumps
d. Exhaust Fans
e. Supply Fans
f. CRAC units
g. VAVs
h. Monitoring of spaces served by Electric Heaters
i. Monitoring of Building Fire Alarm Panel
    1) NOTE: In the event of a fire, the Fire alarm panel will send a signal to the BMS via BACnet of an emergency. The BMS will command DOAS – B, 1, 2, 3, and 4 OFF.

1.4 ACTION SUBMITTALS

1. Product Data: For each type of product include the following:

    1. Detailed product data sheets that identify construction details, material descriptions, dimensions of individual components d profiles, and finishes.
    2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
    3. Product description with complete technical data, performance curves, and product specification sheets.
    4. Installation, operation and maintenance instructions including factors effecting performance.
    5. Bill of materials of indicating quantity, manufacturer, and extended model number for each unique product.

        a. Operator interface work station for BMS
        b. Trane Tracer SC+ BMS Panel
        c. Ethernet switches and routers where necessary
        d. Programmable and application specific DDC controllers.
        e. Instruments (i.e. room sensors, duct sensors, pressure sensors, etc.)
        f. Panel enclosures.
        g. Electrical power supplies
        h. Accessories.
        i. Control dampers and actuators.
        j. Control valves and actuators.

2. Shop Drawings:

    1. General Requirements:

a. Include cover drawing with Project name, location, Owner, Architect, Contractor and issue date with each Shop Drawings submission.
b. Include a drawing index sheet listing each drawing number and title that matches information in each title block.
c. Prepare Drawings using CAD.
d. Drawings Size: Minimum of 11 x 17

2. Schematic drawings for each controlled HVAC system indicating the following:

a. I/O points labeled with point names shown. Indicate instrument range, normal operating set points, and alarm set points. Indicate fail position of each damper and valve, if included in Project.
b. A graphic showing location of control I/O in proper relationship to HVAC system.
c. Wiring diagram with each I/O point having a unique identification and indicating labels for all wiring terminals.
d. Elementary wiring diagrams of controls for HVAC equipment motor circuits including interlocks, switches, relays and interface to DDC controllers.
e. Narrative sequence of operation.

3. Control panel layout drawings indicating the following:

a. Dimensional information to understand size and configuration.

4. DDC system network riser diagram indicating the following:

a. Each device connected to network with unique identification for each.
b. Interconnection of each different network in DDC system.
c. For each network, indicate communication protocol, speed and physical means of interconnecting network devices, such as copper cable type, or fiber-optic cable type. Indicate raceway type and size for each.
d. Each network port for connection of a network panel with unique identification for each.

5. Monitoring and control signal diagrams indicating the following:

a. Control signal cable and wiring between controllers and I/O.
b. Point-to-point schematic wiring diagrams for each product.
c. Control signal tubing to sensors, switches and transmitters.
d. Pneumatic main air and control signal tubing to wireless pneumatic thermostats.

6. Color graphics indicating the following:

a. Itemized list of color graphic displays to be provided.
b. For each display screen to be provided, a true color copy showing layout of pictures, graphics and data displayed.
c. Intended operator access between related hierarchical display screens.
d. The timing of these graphics will be determined by the project progress and may end up occurring toward the end of the project.

1.5 CLOSEOUT SUBMITTALS

1. Operation and Maintenance Data: For DDC system to include in emergency, operation and maintenance manuals.

    1. Include the following:

        a. Project Record Drawings of as-built versions of submittal Shop Drawings provided in electronic PDF format.
        b. Testing and commissioning reports and checklists of completed final versions of reports, and checklists.
        c. As-built versions of submittal Product Data.
        d. Names, addresses, e-mail addresses and 24-hour telephone numbers of Installer and service representatives for DDC system and products.
        e. Operator's manual with procedures for operating control systems including logging on and off, handling alarms, producing point reports, trending data, overriding computer control and changing set points and variables.
        f. Programming manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
        g. Owner training materials.

PART 2 - PRODUCTS

2.1 GENERAL

1. Manufacturers

    1. Trane North Jersey (Basis of Design, contact Mark Snider at 973-294-5209).
    2. Siemens Corporate Office. Florham Park, NJ
    3. Automated Logic Corporate Office. Clifton, NJ
    4. Or approved equal.

2. All controls to be provided, engineered, and installed by the CORPORATE SALES OFFICES of each manufacturer. Independent distributors, integrators, ABCS, ACI, BCS, control contractors, etc. are NOT ACCEPTABLE. No exceptions.

2.2 DDC SYSTEM DESCRIPTION

1. Microprocessor-based monitoring and control including analog/digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices to achieve a set of predefined conditions.

    1. DDC system shall consist of a high-speed, peer-to-peer network of distributed DDC controllers, other network devices, operator interfaces, and software.

2. System shall comply with ASHRAE 135 BACnet protocol requirements and shall seamlessly integrate with existing DDC systems installed and being installed in the building.

3. DDC system proposed is to seamlessly communicate with the web-based BAS centralized server required under this project.

2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 WEB ACCESS

1. DDC system shall be Web based.

1. Web-Based Access to DDC System:

a. DDC system software shall be based on server thin-client architecture, designed around open standards of Web technology. DDC system server shall be accessed using a Web browser over DDC system network, using Owner's LAN, and remotely over Internet through Owner's LAN.
b. Intent of thin-client architecture is to provide operators complete access to DDC system via a Web browser. No special software other than a Web browser shall be required to access graphics, point displays, and trends; to configure trends, points, and controllers; and to edit programming.
c. Web access shall be password protected and contain firewall protections.

2. Web-Compatible Access to DDC System:
a. DDC system shall support Web browser access to building data. Operator using a standard Web browser shall be able to access control graphics and change adjustable set points.
b. Web access shall be password protected.

3. Web-Based DDC system requirements:
a. Owner to provide LAN drop at each controller location (qty. 6)
1) Specifically, owner to provide data cabling (Cat 6e) from controller location to the Building local area network ethernet switch.
b. Owner to provide Static IP address for each controller (qty. 6)
c. If additional Ethernet Switches are required [ethernet switches for access to Building local area network are typically existing], then the ATC contractor is to furnish as a part of this project.

2.4 BUILDING AUTOMATION SYSTEM ARCHITECTURE

1. System architecture shall consist of three levels of LANs.
1. Level one LAN shall represent the communication between network controllers that bridge communication between the centralized server and the field programmable application and application specific DDC controllers.

2. Level two LAN shall represent the communication network interconnecting field mounted programmable controllers, application specific controllers, and other local DDC controllers associated with specific HVAC equipment.

2. System architecture shall be modular and have inherent ability to expand to not less than three times system size indicated with no impact to performance.

3. System architecture shall perform modifications without having to remove and replace existing network equipment.

4. Number of LANs and associated communication shall be transparent to any operator. All I/O points residing on any LAN shall be capable of global sharing between all system LANs.

5. System design shall eliminate dependence on any single device for system control execution. Each controller shall operate independently by performing its' own control functions. Alarming and trending will occur on a capacity basis determined by the type of controller.

2.5 DDC SYSTEM OPERATOR INTERFACES

1. The Operator display for this system is to be provided by the ATC contractor as part of this project. The BMS specified is a web-based enabled panel that is to reside on the building's network. The BMS panel will be able to be accessed by any device that is also on the building's network via a secure username and password.

2. The ATC Contractor must provide a Trane Operator display panel for interaction with the installed BMS. The workstation must allow for full rights to control, modify, change settings, see alarms associated with the Trane Tracer SC. The desktop all in one PC can be hard wired or wireless back to the network panel. The network BMS will still be acceptable from any operator workstation that has a dedicated IP address on the same dedicated network as the w BMS.

3. Operator Display (Work Station) Specifications:

OptiPlex 3050 All-in-One

Catalog Number: 18 / xctoo3050aiousr

Category	Description	Code	SKU	ID
Optiplex 3050 AIO	OptiPlex 3050 AIO XCTO	3050CX	[210-AKOL]	1
Processor	Intel® Core™ i3-7100T (Dual Core, 3M B, 4T, 3.4GHz, 35W); supports Windows 10/Linux	I37100T	[338-BKYQ]	146
Operating System(s)	Windows 10 Pro 64bit English, French, Spanish	10P64M	[619-AHKN]	11
Microsoft Application Software	Microsoft Office 30 Day Trial	16MUI	[658-BCSB]	1002
Hard Drive	2.5 inch 500GB 7200rpm Hard Disk Drive	500S72	[400-ANPO]	8
Additional Hard Drive	No Additional Hard Drive	NADDHD	[401-AADF]	637
Video Card	Intel Integrated Graphics	INT	[490-BBFG]	6
CD ROM/DVD ROM	No Optical Drive	NOPTCL	[429-AAZD]	16
Wireless	No Wireless	NOWRLS	[555-BBFO]	19
Driver	No Wireless	NOWRLS	[555-BBFO]	7
Serial Port/PS2 Adapter	No Accessories	NOACC	[461-AABV]	698
Chassis Options	3050 19.5, HDPlus Non Touch with No Camera, Integrated Graphics, 35W, External Power	NCNTU35	[329-BDIV]	116
Keyboard	Dell KB216 Wired Keyboard English Black	US216B	[580-ADJC]	4
Mouse	Dell MS116 Wired Mouse Black	MS116B	[275-BBBW]	12
Cables and Dongles	No Accessories	NOACCES	[461-AABV]	592
Speakers and Soundbars	No External Speaker	NOESPK	[817-BBBC]	200095
Mounts and Monitor Stands	3050 AiO Articulating Easel Stand	EAS	[575-BBLH]	558
Non-Microsoft Application Software	Windows 10	WIN10	[525-BBCL] [640-BBLW] [658-BBMR] [658-BBRB] [658-BCUV]	1003
Operating System Recovery Options	OS-Windows Media Not Included	NOMEDIA	[620-AALW]	200013

2.6 NETWORKS

1. Acceptable networks for connecting operator workstations and network controllers include the following:
   1. IP.
   2. IEEE 8802-3, Ethernet.

2.7 NETWORK COMMUNICATION PROTCOL

1. Network communication protocol(s) used throughout the entire BAS and associated DDC systems shall utilize open protocols and any software tools applicable shall be provided to the Owner for use in making future modifications to DDC system.

2. ASHRAE 135 Protocol:

    1. ASHRAE 135 communication protocol shall be sole and native protocol used throughout entire DDC system.
    2. DDC system shall not require use of gateways except to integrate HVAC equipment and other building systems and equipment, not required to use ASHRAE 135 communication protocol.
    3. If used, gateways shall connect to DDC system using ASHRAE 135 communication protocol and Project object properties and read/write services indicated by interoperability schedule.
    4. Operator workstations, controllers and other network devices shall be tested and listed by BACnet Testing Laboratories.

3. Industry Standard Protocols:

    1. DDC system shall use any one or a combination of the following industry standard protocols for network communication while complying with other DDC system requirements indicated:

        a. ASHRAE 135. BACnet/MSTP and BACnet/IP

    2. Operator workstations and network controllers shall communicate through ASHRAE 135 protocol.
    3. DDC system networks using ASHRAE 135 communication protocol shall be an open implementation of network devices complying with ASHRAE 135. Network devices shall be tested and listed by BACnet Testing Laboratories.
    4. Portions of DDC system networks using Modbus Application Protocol Specification V1.1b communication protocol shall be an open implementation of network devices and technology complying with Modbus Application Protocol Specification V1.1b.
    5. Gateways shall be used to connect networks and network devices using different protocols.

2.8 ASHRAE 135 GATEWAYS

1. Include BACnet communication ports, whenever available as an equipment OEM standard option, for integration via a single communication cable. BACnet-controlled plant equipment includes, but is not limited to, boilers, chillers, variable-speed drives, etc.

2.9 DDC CONTROLLERS

1. DDC system shall consist of a combination of network controllers, programmable application controllers and application-specific controllers to satisfy performance requirements indicated.

2. DDC controllers shall perform monitoring, control, energy optimization and other requirements indicated.

3. DDC controllers shall use a multitasking, multiuser, real-time digital control microprocessor with a distributed network database and intelligence.

4. Each DDC controller shall be capable of full and complete operation as a completely independent unit and as a part of a DDC system wide distributed network.

5. Environment Requirements:

    1. Controller hardware shall be suitable for the anticipated ambient conditions.
    2. Controllers located in conditioned space shall be rated for operation at 32 to 120 deg F

6. Power and Noise Immunity:

    1. Controller shall operate at 90 to 110 percent of nominal voltage rating and shall perform an orderly shutdown below 80 percent of nominal voltage.
    2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios with up to 5 W of power located within36 inches of enclosure.

7. DDC Controller Spare Processing Capacity:

    1. Memory shall support DDC controller's operating system and database and shall include the following:

        a. Monitoring and control.
        b. Energy management, operation and optimization applications.
        c. Alarm management.
        d. Operator interfaces.

8. Input and Output Point Interface:

    1. Hardwired input and output points shall connect to network, programmable application and application-specific controllers.
    2. Input and output points shall be protected so shorting of point to itself, to another point, or to ground will not damage controller.
    3. Input and output points shall be protected from voltage up to 24 V of any duration so that contact will not damage controller.
    4. AIs:

        a. AIs shall include monitoring of low-voltage (zero- to 10-V dc), current (4 to 20 mA) and resistance signals from thermistor and RTD sensors.
        b. AIs shall be compatible with, and field configurable to, sensor and transmitters installed.
        c. Controller AIs shall perform analog-to-digital (A-to-D) conversion with a minimum resolution of 8 bits or better to comply with accuracy requirements indicated.
        d. Signal conditioning including transient rejection shall be provided for each AI.
        e. Capable of being individually calibrated for zero and span.

5. AOs:

    a. Controller AOs shall perform analog-to-digital (A-to-D) conversion with a minimum resolution of 8 bits or better to comply with accuracy requirements indicated.
    b. Output signals shall have a range of 4 to 20 mA dc or zero- to 10-V dc as required to include proper control of output device.
    c. Capable of being individually calibrated for zero and span.
    d. AOs shall not exhibit a drift of greater than 0.4 percent of range per year.

6. BIs:

    a. Controller BIs shall accept contact closures and shall ignore transients of less than 5-ms duration.
    b. Isolation and protection against an applied steady-state voltage of up to 180-V ac peak.
    c. BIs shall include a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against effects of contact bounce and noise.
    d. BIs shall sense "dry contact" closure without external power (other than that provided by the controller) being applied.
    e. Pulse accumulation input points shall comply with all requirements of BIs and accept up to 10 pulses per second for pulse accumulation. Buffer shall be provided to totalize pulses. Pulse accumulator shall accept rates of at least 20 pulses per second. The totalized value shall be reset to zero on operator's command.

7. BOs:

    a. Controller BOs shall include relay contact closures or triac outputs for momentary and maintained operation of output devices.

        1) Relay contact closures shall have a minimum duration of 0.1 second. Relays shall include at least 180 V of isolation. Electromagnetic interference suppression shall be provided on all output lines to limit transients to non-damaging levels. Minimum contact rating shall be 1 A at 24-V ac.
        2) Triac outputs shall include at least 180 V of isolation. Minimum contact rating shall be 1 A at 24-V ac.

    b. BOs shall include for two-state operation or a pulsed low-voltage signal for pulse-width modulation control.
    c. BOs shall be selectable for either normally open or normally closed operation.
    d. Include tri-state outputs (two coordinated BOs) for control of three-point floating-type electronic actuators without feedback.

2.10 NETWORK CONTROLLERS

1. General Network Controller Requirements:

    1. Include adequate number of controllers to achieve performance indicated.

2. System shall consist of one or more independent, standalone, microprocessor-based network controllers to manage global strategies indicated.
3. Controller shall have enough memory to support its operating system, database, and programming requirements.
4. Data shall be shared between networked controllers and other network devices.
5. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
6. Controllers shall have a real-time clock.
7. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
8. Controllers shall be fully programmable.

2. Communication:

1. Network controllers shall communicate with other devices on DDC system Level one network.
2. Network controller also shall perform routing if connected to a network of programmable application and application-specific controllers.

3. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall maintain BIOS and programming information in event of a power loss for at least 72 hours.

2.11 PROGRAMMABLE APPLICATION CONTROLLERS

1. General Programmable Application Controller Requirements:

1. Include adequate number of controllers to achieve performance indicated.
2. Controller shall have enough memory to support its operating system, database, and programming requirements.
3. Data shall be shared between networked controllers and other network devices.
4. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
5. Controllers shall have a real-time clock.
6. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
7. Controllers shall be fully programmable.

2. Communication:

1. Programmable application controllers shall communicate with other devices on network.

3. Serviceability:

    1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
    2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
    3. Controller shall maintain BIOS and programming information in event of a power loss for at least 72 hours.

2.12 PANEL ENCLOSURES

1. BMS Panel Enclosure:

Operating Environment Specifications

Make sure that the operating environment conforms to the specifications listed in Table 1.

Table 1. Specifications

Temperature	From 32°F to 122°F (0°C to 50°C)
Humidity	5–95% non-condensing
Power requirements	120 Vac, 6A maximum, 1 phase, 60 Hz
Weight	Mounting surface must be able to support 60 lb. (28 kg)
Dimensions	16 ½ in. × 14 ¾ in. × 5 ½ in. (418 mm × 373 mm × 140 mm)
Installation	U.L. 840: Category 3
Pollution	U.L. 840: Degree 2

The power output of the panel is de-rated at higher ambient temperatures to account for the heat rise in the panel. Table 2 shows the ratings.

Table 2. Power Output

VA at 24 Vac	Temperature Range C°/F°
85	up to 35°C (95°F)
75	up to 45°C (113°F)
50	up to 50°C (122°F)

2. VRF System Controller Panel Enclosure (TE-200 & TW-50A):
    1. TW-50A controllers will reside in the above BMS panel enclosure noted in the above section
    2. TE-200 controllers will reside in the below panel enclosure:

Specifications and Dimensions

Operating Environment Specifications

Ensure the operating environment conforms to the specifications listed in Table 1.

Table 1. Specifications

Temperature	From 32°F to 122°F (0°C to 50°C)
Humidity	5–95% non-condensing
Power requirements	120 VAC, 5A maximum, 1 phase, 60 Hz
Weight	Mounting surface must be able to support 75 lb (34 kg)
Dimensions	15 in. x 20 in. x 5.5 in. (38 cm x 51 cm x 14.0 cm)
Installation	U.L. 840: Category 3
Pollution	U.L. 840: Degree 2

The power output of the panel is rated at higher ambient temperatures to account for the heat rise in the panel. Refer to Table 2 for power ratings.

Table 2. Power Output For Transformer

VA at 24 VAC	Temperature Range C°/F°
85	Up to 95°F (35°C)
75	Up to 113°F (45°C)
50	Up 122°F to (50°C)

2.13 THERMOSTATS

A. Manufacturers:

1. Trane North Jersey (Basis of Design, Model Deluxe Wired MA Remote Controller Model TAR-40MAAU)
2. Siemens Corporate Office. Florham Park, NJ
3. Automated Logic Corporate Office. Clifton, NJ
4. Or approved equal.

B. Model of the thermostat to be provided with VRF indoor units. Please see plans for details on quantities and locations.

C. Specifications:

OPERATION/DISPLAY

- ON/OFF
  - Switches between ON and OFF.
- Operation mode switching
  - Switches between Cool/Dry/Fan/Auto/Setback/Heat.
- Hold
  - Switches between enable and disable the Hold function.
  - If the Hold function is enable, the following functions will be prohibited.
  - ON/OFF timer/Schedule (Weekly timer) /Auto return/Auto-OFF timer
- Temperature setting
  - Changes the set temperature.
  - Set temperature range varies depending on the indoor unit model.
- Fan speed setting
  - Changes fan speed.
  - Available fan speeds vary depending on the model.
- Air flow direction setting
  - Changes airflow direction.
  - Available airflow directions vary depending on the model.
- Louver setting
  - Switches between louver ON/OFF.
- Ventilation equipment control
  - Interlocked setting and interlocked operation setting with City Multi Lossnay units can be performed.
  - The Stop/Low/High settings of the ventilation equipment can be controlled.
- Main display mode setting
  - The Main display can be displayed in two different modes: "Full" and "Basic."
- B&W inversion
  - The colors of the display can be inverted, turning white background to black and black characters to white.
- Clock *2
  - Date (year/month/day) and time (hour/minute) can be set.
  - The set time as well as the day of the week will be displayed on the Main display.
  - It is also possible for the time to not display on the main display.
  - The clock can be displayed in 12-hour format (AM/PM before or after the time) and 24-hour format.
- Daylight saving time
  - The start/end time for daylight saving time can be set.
  - The daylight saving time function will be activated based on the setting contents.
- Room temp. display
  - The room temperature display can be enabled or disabled.
- Error information
  - When an error occurs, an error code and the unit address appear.
  - The air-conditioning unit model, serial number, and contact number can be set to appear when an error occurs. (The above information needs to be entered in advance.)
- Filter information
  - A filter sign will appear when it is time to clean the filter.
- Remote controller information
  - The version of the remote controller can be checked.

*1 This function is active only for the units that support the function.
*2 The clock is accurate within 45 seconds per month (at the temperature of 77°F [25ºC]).
The clock is backed up for 3 days.

SCHEDULE AND TIMER SETTING

- Timer
  - ON/OFF timer
    - Turns ON and OFF daily at a set time.
    - Time can be set in 5-minute increments.
    - It is also possible to set the ON time only or the OFF time only.
  - Auto-OFF timer
    - Turns off the unit after a certain period of operation.
    - Operation time can be set to a value from 30 to 240 minutes in 10-minute increments.
- Weekly timer
  - Weekly ON/OFF times and set temperatures can be set.
  - Time can be set in 5-minute increments. Up to 8 schedule patterns can be set per day of the week.
  - Not valid when the ON/OFF timer is set.

RESTRICTION SETTINGS

- Allows/disallows local operation
  - The following operation can be prohibited by applying certain settings on the centralized controller: ON/OFF, operation mode, set temperature, filter sign reset, air direction, fan speed and timer.
  - While an operation is prohibited, the operation icon lights up (only on the Main display in the "Full" mode).
- Operation lock
  - The following operations can be prohibited: Sensing Location, ON/OFF, Mode, Set temp., Menu, Fan, Louver, Vane, or Hold
- Temperature range restriction
  - The room temperature range for each operation mode can be restricted.
- Auto return
  - The units operate at the preset temperature after a designated period.
    - Time can be set to a value from 30 to 120 minutes in 10-minute increments.
  - Not valid when the temperature setting range is restricted.
- Password
  - Administrator password (required for schedule setting etc.) and Maintenance password (required for test run and function setting etc.) can be set.

MISCELLANEOUS ITEMS

- Language Selection
  - Select the display language from the following 3 languages.
    - English, French, Spanish
- Brightness Contrast
  - The brightness of the LCD can be adjusted. The contrast of the LCD can be adjusted.
- Manual Vane Angle *1
  - Fixes the vane position for each air outlet.
- Service *1
  - Contains Test run, Function setting, Request code, and Error history.
- 3D i-see Sensor
  - Settings for 3D i-see Sensor can be made.

ENERGY SAVING OPTION

- No occupancy energy save
  - Requires 3D i-see sensor on applicable indoor units
- Room Occupancy energy save
  - Requires 3D i-see sensor on applicable indoor units
- No occupancy Auto-OFF
  - Requires 3D i-see sensor on applicable indoor units
- Setback Mode

*1 This function is active only for the units that support the function.
*2 The clock is accurate within 45 seconds per month (at the temperature of 77°F [25ºC]).
The clock is backed up for 3 days.

2.14 CO2 SENSORS

A. Manufacturers:

1. Trane North Jersey (Basis of Design, Trane Model X13790422010)
2. Siemens Corporate Office. Florham Park, NJ
3. Automated Logic Corporate Office. Clifton, NJ
4. Or approved equal.

B. See table below for all sensor's characteristics.

Type	Description
Duct mount	3.3 in x 1.8 in x 5.6 in (84 mm x 46 mm x 142 mm)
Wall mount	4.8 in x 2.9 in x 1.1 in (121 mm x 74 mm x 28 mm)
Probe length	8.00 in (203 mm)
CO_2 range	0–2000 ppm CO_2
Accuracy at 25°C	±30 ppm CO_2 +3% of reading (includes repeatability)
Pressure dependence of output	+1.6% of reading per kPa
Annual zero drift	±10 ppm
Recommended calibration interval	None (auto-calibrated)
Response time	< 3 minutes
Operating temperature	From 32°F to 122°F (0°C to 50°C)
Storage temperature	From -40°F to 158°F (-40°C to 70°C)
Humidity range	0–85% relative humidity (RH)
Airflow range	0–33 ft/s (0–10 m/s)
Output signals	• OUT1 (V): 0–10 VDC • OUT2 (I): 4–20 mA or 2–10 VDC (jumper controlled) **Note:** Sensor is capable of both simultaneously
Resolution of analog outputs	2ppm CO_2 Voltage: Rout < 100 Ω, RLoad > 5 kΩ
Recommended external load	Current: RLoad > 500 Ω
Power supply	Nominal 24 Vac or 24 Vdc
Power consumption	< 1 watt average
Warm-up time	≤ 1 min @full spec ≤ 15 min
Housing material	ABS (duct), polycarbonate/ABS blend (wall)

2.15 TEMPERATURE SPACE SENSORS (WALL FLUSH-MOUNTED)

A. Manufacturers

1. Precon (Basis of Design: Model ST-S series)
2. Siemens
3. Honeywell
4. Or approved equal.

B. Construction:

1. 430 Stainless steel finish
2. Lifetime warranty

3. Accuracy 0.27 deg F or 0.54 deg RTD
4. Insulated backing for room temperature response.
5. Vandal-resistant flush mounting
6. Standard size plate to cover mounting holes.

C. Specification as follows:

SPECIFICATIONS

Accuracy		**Temperature Coefficient**	
Thermistor	±0.36°F (0.2°C)	**Thermistor**	Negative temperature coefficient
RTD		**RTD**	Positive temperature coefficient
Type 63	±0.72°F (0.40°C)	**Temperature Stability**	
Type 71	+/-0.0774°F (0.043°C)	**Thermistor**	0.24°F (0.13°C) over five years
Type 81, 85	±0.27°F (0.15°C)	**RTD**	Max 0.04% after 1k hours @ 500 °C
Type 91	±0.54°F (0.30°C)	**Heat Dissipation**	2.7 mW/°C (power needed to raise the temperature by 1°C)
Sensor Type		**Enclosure Rating**	NEMA 1, Brushed stainless steel
Thermistor	2.252 kΩ, 3 kΩ, 10 kΩType II, III & III w/11K shunt, 20 kΩ, 100 kΩ	**Mounting**	Directly to wall or single gang box
RTD		**Wiring Terminations**	8' of 24 AWG pigtails prestripped ends, Type 71 & 81 sensors have 18" leads
Type 63	1000Ω Nickel		
Type 71, 81	100Ω Pt 385 Curve	**Weight**	0.2 lb (0.1 Kg)
Type 85	1000Ω Pt 385 Curve	**Approvals**	CE
Type 91	1000Ω Pt 375 Curve	**Warranty**	Lifetime
Temperature Range			
Thermistor/RTD	-40° to 221°F (-40° to 105°C)		

2.16 APPLICATION-SPECIFIC CONTROLLERS

A. Description: Microprocessor-based controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. Controllers are not fully user-programmable but are configurable and customizable for operation of equipment they are designed to control.

1. Capable of standalone operation and shall continue to include control functions without being connected to network.
2. Data shall be shared between networked controllers and other network devices.

B. Communication: Application-specific controllers shall communicate with other application-specific controller and devices on network, and to programmable application and network controllers.

C. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall use nonvolatile memory and maintain all BIOS and programming information in event of power loss.

2.17 CONTROL WIRE AND CABLE

A. Single Twisted Shielded Instrumentation Cable 24 V and Less:

1. Wire size shall be a minimum No. 22 AWG.

2. Conductors shall be a twisted, 7/24 soft annealed copper stranding with a 2- to 2.5-inch lay.
3. Conductor insulation shall have a nominal 15-mil thickness, constructed from flame-retardant PVC.
4. Shielding shall be 100 percent type, 1.35-mil aluminum/polymer tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 300-V, 105-deg C rating and shall be Type PLTC cable.

B. LAN and Communication Cable: Comply with DDC system manufacturer requirements for network being installed.

1. Cable shall be plenum rated.
2. Cable shall comply with NFPA 70.
3. Cable shall have a unique color that is different from other cables used on Project.
4. Copper Cable for Ethernet Network:

a. 100BASE-TX
b. TIA/EIA 586, Category 5e or Category 6
c. Minimum No. 22 AWG solid.
d. Shielded Twisted Pair (STP)
e. Thermoplastic insulated conductors, enclosed in a thermoplastic outer jacket, Class CMP as plenum rated.

3 EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for products to verify actual locations of connections before installation.

1. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
2. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

B. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.

3.2 DDC SYSTEM INTERFACE WITH OTHER SYSTEMS AND EQUIPMENT

A. Communication Interface to Equipment with Integral Controls:

1. DDC system shall have communication interface with equipment having integral controls and having a communication interface for remote monitoring or control.
2. Equipment to Be Connected:

a. The furnished equipment under this project and locate on the Trane Tracer SC network panel in building (as shown on plans).

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install products level, plumb, parallel, and perpendicular with building construction.

B. Support products, tubing, piping wiring and raceways. Brace products to prevent lateral movement and sway or a break in attachment when subjected to a force.

C. If product locations are not indicated, install products in locations that are accessible and that will permit service and maintenance from floor, equipment platforms, or catwalks without removal of permanently installed furniture and equipment.

3.4 CONTROLLER INSTALLATION

A. Install controllers in enclosures to comply with indicated requirements.

B. Connect controllers to field power supply

C. Install controller with latest version of applicable software and configure to execute requirements indicated.

D. Test and adjust controllers to verify operation of connected I/O to achieve performance indicated requirements while executing sequences of operation.

E. Installation of Network Controllers:

1. Quantity and location of network controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. Install controllers in a protected location that is easily accessible by operators.

F. Installation of Programmable Application Controllers:

1. Quantity and location of programmable application controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. Install controllers in a protected location that is easily accessible by operators.

G. Application-Specific Controllers:

1. Quantity and location of application-specific controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. For controllers not mounted directly on equipment being controlled, install controllers in a protected location that is easily accessible by operators.

3.5 NETWORK INSTALLATION

A. Coordinate network connections with the Owner's IT personnel and provide Ethernet cabling as required between the following network devices.

1. Network controllers.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections

3.7 COMMUNICATION WIRING

A. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer’s installation recommendations for all communication cabling.

B. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.

C. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer shall not be exceeded during installation.

D. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.

E. When a cable enters or exits a building, a lighting arrestor must be installed between the line and ground.

F. All runs of communication wiring shall be unspliced length when the length is commercially available.

G. All communication wiring shall be labeled to indicate origin and destination.

3.8 CONTROL SYSTEM CHECKOUT AND TESTING

A. Start-up testing. All testing in this section shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner’s representative is notified of the system demonstration.

B. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service all of the instruments, controls, and accessory equipment furnished under this specification.

1. Verify that all control wiring is properly connected and free os all shorts and ground faults. Verify that terminations are tight.

2. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturer’s recommendations.

3. Verify all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starter, etc.) operate properly and normal positions are correct.

4. Verify all analog output devices (I/Ps, actuators, etc) are functional, that startand span are correct, and that direection and normal positions are correct. The contractor shall check all

control valves and autoatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.

5. Verify the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimal start/stop routimes.

6. Alarms and Interlocks

   a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
   b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction,
   c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

C. Test and Balance:

1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.

2. The contractor shall provide training in the use of these tools. This training will be planned for a duration of 4 hours.

3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.

4. The tools used during the test and balance process shall be returned to the contractor at the completion of the testing and balancing.

C. Equipment Commissioning:

1. The contractor is to verify and confirm that all HVAC equipment integrated to the BMS is in good working condition. Contractor to conform to the above Checkout, start up, and Test/Balance guidelines mentioned above. Additionally, the contractor is to prove proper operation of the equipment and it is in accordance with the plans/specifications any time prior to TCO and during the first year of warranty.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative with complete knowledge of Project-specific system installed to train Owner's maintenance personnel to adjust, operate, and maintain DDC system.

B. Extent of Training:

1. Base extent of training on scope and complexity of DDC system indicated and training requirements indicated. Provide extent of training required to satisfy requirements indicated even if more than minimum training requirements are indicated.

2. Inform Owner of anticipated training requirements if more than minimum training requirements are indicated.
3. Minimum Training Requirements:

    a. Provide not less than eight hours of training total.
    b. Stagger training over multiple training classes to accommodate Owner's requirements. All training shall occur before end of warranty period.

3.9.1.2 WARRANTY

A. Warrant all work as follows:

B. BAS system labor and materials shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. BAS failures during the warranty period shall be adjusted, repaired, or replaced at no charge to the Owner. The BAS manufacturer shall respond to the Owner's request for warranty service within 24 hours of the initiated call and will occur during normal business hours (8AM-5PM).

C. At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the BAS is operational, and has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of the warranty period.

D. Operator workstation software, project specific software, graphics, database, and firmware updates shall be provided to the Owner at no charge during the warranty period. Written authorization by the Owner must be granted prior to the installation of these updates.

E. The BAS manufacturer shall provide a web-accessible Users Network for the proposed System and give the Owner free access to question/answer forum, graphics library, user tips, upgrades, and training schedules for a one year period of time correlating with the warranty period.

F. In-Warranty Service Agreement: In addition to the warranty mentioned above, the BAS contractor is to provide an in-warranty service agreement to service the BAS that is to be installed as a part of this project. The in-warranty service agreement shall consist of (4) seasonal on-site visits by a BAS service technician consisting of (1) man-day each during the warranty period. The service visits shall consist of, but are not limited to, the following: Operator consultation, cleaning up overrides, programming changes at owner’s request, setpoint changes at Owner’s request, “health” analysis of BMS, and proactive service recommendations based off BMS analysis.

END OF SECTION 230900

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:

1. Copper tube and fittings
2. Joining materials.
3. Transition fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:
1. Copper tube and fittings
2. Joining materials.
3. Transition fittings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Piping layout, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Other building services.
3. Structural members.

B. Qualification Data: For Installer.

C. Welding certificates.

D. Field quality-control reports.

E. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
1. Condensate-Drain Piping: 150 deg F.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.

C. DWV Copper Tubing: ASTM B 306, Type DWV.

D. Wrought-Copper Unions: ASME B16.22.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

F. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Condensate-Drain Piping: Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Condensate drain piping: Install piping with slopes or 1 inch per 20 feet.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the top or side of the main pipe.

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

R. Install shutoff valve immediately upstream of each dielectric fitting.

S. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices.

B. Comply with requirements in Section 230548 "Vibration and Wind Controls for HVAC".

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

3.5 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

3.6 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.

2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

A. Refrigerant pipes and fittings.
B. Refrigerant piping valves and specialties.
C. Refrigerants.
D. Flexible refrigerant copper pipe connectors
E. Vibration absorbers for VRF systems

B. Section Includes:
A. Section 230529 "Hangers and Supports for HVAC Piping and Equipment”
B. Section 230719 "HVAC Piping Insulation."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty.

A. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Hot-gas bypass valves.
4. Filter dryers.
5. Strainers.
6. Pressure-regulating valves.

B. Shop Drawings:

A. Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes; flow capacities; valve arrangements and locations; slopes of horizontal runs; oil traps; double risers; wall and floor penetrations; and equipment connection details.
B. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
C. Show interface and spatial relationships between piping and equipment.
D. Shop Drawing Scale: 1/4 inch equals 1 foot.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.7 PRODUCT STORAGE AND HANDLING

A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

A. Suction Lines for Air-Conditioning Applications: 300 psig.
B. Suction Lines for Heat-Pump Applications: 535 psig.
C. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

A. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
B. End Connections: Socket ends.
C. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
D. Working Pressure Rating: Factory test at minimum 500 psig.
E. Maximum Operating Temperature: 250 deg F.

2.3 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Atofina Chemicals, Inc.
2. DuPont Fluorochemicals Div.
3. Hudson Technologies.
4. Or approved equal.

2.4 FLEXIBLE REFRIGERANT COPPER PIPE CONNECTORS AND VIBRATION ABSORBERS

A. Manufacturers:

1. Metraflex (Basis of Design, Model VAVRF8 or RAF)
2. Packless Industries
3. Grainger Approved
4. Or approved equal.

B. Construction:

1. Type: Sweat Connection
2. Overall length: 12 inches or as recommended by manufacturer.
3. Connection material: Copper
4. Material: Stainless steel, bronze, bronze hose, bronze braid, brazed joints, copper ferrule, female copper tube end.
5. Maximum Working Pressure: 650 PSI
6. Minimum Temperature rating: 300 deg. F
7. Suitable for refrigerant R410 and other type of refrigerants.
8. Copper tube meets as a standard B16.18-1950 and ASA 16.22-1951.
9. Type of end connections: Brazed welded joints.
10. Application: Refrigerant systems in which line vibrations need to be minimized to reduce system noise transmission and stress relief in the piping system.
11. Compliance: Tested and recognized by UL.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR ALL REFRIGERANTS

A. Suction, Hot-Gas and Liquid Lines for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.

B. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.

B. The refrigerant system shall be composed of pre-assembled air handling units and condensing units. The manufacturer shall approve and verify all pipe sizes and layouts before installation. Install all refrigerant piping and accessories as per the manufacturer’s recommendations.

C. Install refrigerant piping according to ASHRAE 15.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Slope refrigerant piping as follows:

   A. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
   B. Install horizontal suction lines with a uniform slope downward to compressor.
   C. Install traps and double risers to entrain oil in vertical runs.
   D. Liquid lines may be installed level.

L. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

M. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

N. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

O. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

A. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
B. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

D. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.4 HANGERS AND SUPPORTS

A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

A. Comply with ASME B31.5, Chapter VI.
B. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
C. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

1. Fill system with nitrogen to the required test pressure.
2. System shall maintain test pressure at the manifold gage throughout duration of test.

3. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
4. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures:

A. Install core in filter dryers after leak test but before evacuation.
B. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
C. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
D. Charge system with a new filter-dryer core in charging line.

3.7 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

A. Open shutoff valves in condenser water circuit.
B. Verify that compressor oil level is correct.
C. Open compressor suction and discharge valves.
D. Open refrigerant valves except bypass valves that are used for other purposes.
E. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.
6. Internal Duct Liner Insulation - Acoustical Insulation

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top and bottom of ducts.
5. Dimensions of allduct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.

10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations for selecting hangers and supports.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: A single set of plans or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

B. Welding certificates.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."

E. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

F. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized or galvannealed sheet steel as stated in Duct Schedule Section 3.10 (A) below.

B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." All longitudinal seams shall be Pittsburgh lock seams unless otherwise specified for specific application.

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized or galvannealed sheet steel as stated in Duct Schedule Section 3.10 (A) below.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

   a. Ductmate Industries, Inc.
   b. Elgen Manufacturing.
   c. MKT Metal Manufacturing.
   d. SEMCO, LLC; part of FlaktGroup.
   e. Spiral Manufacturing Co., Inc.
   f. Or approved equal

B. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A653/A653M.

1. Steel Sheet, Zinc-Coated
2. Galvanized Coating Designation: G90
3. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Galvannealed Sheet Steel: Comply with ASTM A653/A653M.

1. Steel Sheet, Zink-Iron Alloy-Coated
2. Galvannealed Coating Designation: A60.
3. Finishes for Surfaces Exposed to View: Spangle-free.

D. Aluminum Sheets: Comply with ASTM B209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

E. Factory- or Shop-Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested in accordance with ASTM D3363.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
5. Shop-Applied Coating Color: White.
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

F. Reinforcement Shapes and Plates: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch-minimum diameter for lengths 36 inches or less; 3/8-inch-minimum diameter for lengths longer than 36 inches.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10 inch wg, positive and negative.
7. Service: Indoor and outdoor.

8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. Sealant shall have a VOC content of 420 g/L or less.
11. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10 inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. Sealant shall have a VOC content of 420 g/L or less.
7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.

B. Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.7 INTERNAL DUCT AND PLENUM LINER INSULATION

A. Material:
1. Type: ASTM C1071, Type II, rigid, glass fiber duct liner with coated air side or fiberglass duct liner board with black surface.
2. Density: Minimum 1-1/2 lbs. per cubic foot.
3. Thickness: 1 inch minimum.
4. Thermal Conductivity:0.23 Btu-Inch/hr. ft^2. °F @ 75°F mean temperature.
5. Maximum Air Velocity: 4,000 feet per minute

B. Adhesives and Accessories:

1. Acoustical Lining Insulation Adhesive: Insulation shall be applied in cut-to-size pieces attached to the interior of the duct with a nonflammable, fire-resistant adhesive conforming to ASTM C 916, Type I. Exposed edges of the liner at the duct ends and at other joints where the lining will be subject to erosion shall be coated with a heavy brush coat of the nonflammable, fire-resistant adhesive to prevent delamination of glass fibers.
2. Mineral Fiber Insulation Cement: Cement shall be in accordance with ASTM C 195.
3. Lagging Adhesive: Lagging adhesives shall be nonflammable and fire-resistant and shall have flame spread and smoke developed ratings of 25/50 when measured in accordance with ASTM E 84.

C. Location of the acoustical lining insulation

1. The acoustical lining insulation shall be provided inside duct distribution system, transfer ducts and plenums as shown on the construction drawings.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.

B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

J. Install fire, combination fire/smoke, and smoke dampers where indicated on Drawings and as required by code, and by local authorities having jurisdiction. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers and specific installation requirements of the damper UL listing.

K. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

M. Elbows: Use long-radius elbows wherever they fit.

1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

N. Branch Connections: Use lateral or conical branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter.

D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. All Ducts: Seal Class A.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

G. Ducts, Transfer Ducts and Plenum Liner:

1. Adhere insulation with adhesive for 100 percent coverage.
2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.

5. Cut insulation for tight overlapped corner joints. Support top pieces of liner at edges with side pieces.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

B. Paint exterior of metal ducts that are exposed and are in conditioned spaces. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

    a. Ducts with a Pressure Class 3-Inch wg and Higher: Test representative duct sections, selected by the building owner or the designated representative of the building owner from sections installed, totaling no less than 25 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Testing of each duct section is to be performed with access doors, coils, filters, dampers, and other duct-mounted devices in place as designed. No devices are to be removed or blanked off so as to reduce or prevent additional leakage.
5. Test for leaks before applying external insulation.
6. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
7. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness in accordance with "Description of Method 3 - NADCA Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

    a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use duct cleaning methodology as indicated in NADCA ACR.

C. Use service openings for entry and inspection.

1. Provide openings with access panels appropriate for duct static-pressure and leakage class at dampers, coils, and any other locations where required for inspection and cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

D. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

E. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

F. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans in accordance with NADCA ACR. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents in accordance with manufacturer's written instructions after removal of surface deposits and debris.

3.9 STARTUP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

A. Fabricate ducts, fittings, etc. with steel sheet as follows:

1. Unpainted Ductwork

    a. Construct supply, return, exhaust, and outside air ducts of galvanized sheet steel for all ductwork and associated accessories which does not require painting, the ductwork is in concealed conditioned or unconditioned spaces and requires exterior thermal insulation.

2. Painted Ductwork

    a. Construct supply, return, exhaust, and outside air ducts of galvannealed sheet steel for all ductwork and associated accessories which require painting, the ductwork is in exposed conditioned spaces and does not require exterior thermal insulation.

B. Fabricate ducts with galvanized or galvannealed sheet steel as follows:

1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.
2. Toilet Rooms, Janitor Closets, Etc.: All ducts serving the Toilet Rooms, Janitor Closets, or any other humid or corrosive area shall have ducts fabricated with aluminum.

C. All Supply Ducts:

1. Pressure Class: Positive or negative 3-inch wg.
2. Minimum SMACNA Seal Class: A.
3. SMACNA Leakage Class for Rectangular: 8.
4. SMACNA Leakage Class for Round: 4.

D. All Exhaust, Return and Transfer Ducts:

1. Pressure Class: Positive or negative 3-inch wg.
2. Minimum SMACNA Seal Class: A.
3. SMACNA Leakage Class for Rectangular: 8.
4. SMACNA Leakage Class for Round: 4.

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. Galvannealed-Steel Ducts: Galvannealed steel.
3. Aluminum Ducts: Aluminum.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

   a. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

      1) Radius-to Diameter Ratio: 1.5.

   b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
   c. Round Elbows, 14 Inches and Larger in Diameter: Welded.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Conical spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

    a. Velocity 1000 fpm or Lower: 90-degree tap.
    b. Velocity 1000 to 1500 fpm: Conical tap.
    c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft dampers.
2. Manual volume dampers.
3. Fire dampers.
4. Combination fire and smoke dampers.
5. Outdoor Air Monitoring station.
6. Flange connectors.
7. Turning vanes.
8. Duct-mounted access doors.
9. Flexible connectors.
10. Duct accessory hardware.

B. Related Requirements:

1. Section 233346 "Flexible Ducts" for insulated and non-insulated flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.

1. Detail duct accessories' fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control-damper installations.
d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor-damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
e. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, or BIM model, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from installers of the items involved.

B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 90A and NFPA 90B.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MANUAL VOLUME DAMPERS

A. Low-Leakage, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

a. Air Balance; a division of MESTEK, Inc.
b. Pottorff.
c. Ruskin Company.
d. Or approved equal.

2. Performance:

a. AMCA Certification: Test and rate in accordance with AMCA 511.

b. Leakage:

1) Class IA: Leakage shall not exceed 3 cfm/sq. ft. against 1-inch wg differential static pressure.

3. Construction:

a. Linkage out of airstream.
b. Suitable for horizontal or vertical airflow applications.

4. Frames:

a. Hat, U, or angle shaped.
b. Thickness: 0.08-inch aluminum sheet channels.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Roll-Formed Aluminum Blades:0.072-inch thick aluminum sheet.

6. Blade Edging Seals:

a. Closed-cell neoprene.

7. Blade Jamb Seals: Flexible metal compression type.
8. Blade Axles: Stainless steel.
9. Bearings:

a. Oil-impregnated stainless steel sleeve.
b. Dampers mounted with vertical blades to have thrust bearings at each end of every blade.

10. Tie Bars and Brackets: Aluminum.
11. Locking device to hold damper blades in a fixed position without vibration.

B. Jackshaft:

1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle, made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.3 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

1. Greenheck Fan Corporation.
2. Pottorff.
3. Ruskin Company.
4. Or approved equal.

B. General Requirements:

1. Unless otherwise indicated, use parallel-blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed-blade configuration.
2. Factory or field assemble multiple damper sections to provide a single damper assembly of size required by the application.

C. Performance:

1. AMCA Certification: Test and rate in accordance with AMCA 511.
2. Leakage:

    a. Class IA: Leakage shall not exceed 3 cfm/sq. ft. against 1-inch wg differential static pressure.

3. Pressure Drop: 0.05 inch wg at 1500 fpm across a 24-by-24-inch damper when tested in accordance with AMCA 500-D, Figure 5.3.
4. Velocity: Up to 3000 fpm.
5. Temperature: Minus 25 to plus 180 deg F.
6. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.

D. Construction:

1. Linkage out of airstream.
2. Suitable for horizontal or vertical airflow applications.
3. Frames:

    a. Hat, U, or angle shaped.
    b. 0.08-inch-thick extruded aluminum.
    c. Mitered and welded corners.
    d. Flanges for attaching to walls and flangeless frames for installing in ducts.

4. Blades:

    a. Multiple blade with maximum blade width of 6 inches.
    b. Parallel or Opposed-blade design.
    c. Aluminum.
    d. 14-gauge-thick air foil dual skin.

5. Blade Edging Seals:

    a. Replaceable Closed-cell neoprene.

6. Blade Jamb Seal: Flexible stainless steel, compression type.
7. Blade Axles: 1/2-inch diameter; stainless steel.
8. Blade-Linkage Hardware: Zinc-plated steel and brass; ends sealed against blade bearings. Linkage mounted out of air stream.
9. Bearings:

    a. Oil-impregnated stainless steel sleeve.
    b. Dampers mounted with vertical blades to have thrust bearings at each end of every blade.

E. Damper Actuator - Electric:

1. Electric - 120 V ac or 24 V ac.
2. UL 873, plenum rated.
3. Two position or Fully modulating, with fail-safe spring return.

    a. Sufficient motor torque and spring torque to drive damper fully open and fully closed with adequate force to achieve required damper seal.
    b. Minimum 90-degree drive rotation.

4. Clockwise or counterclockwise drive rotation as required for application.
5. Environmental Operating Range:

    a. Temperature: Minus 40 to plus 130 deg F.
    b. Humidity: 5 to 95 percent relative humidity noncondensing.

6. Environmental enclosure: NEMA 1 and suitable for plenum return application.
7. Actuator to be factory mounted and provided with a single-point wiring connection.

F. Controllers, Electrical Devices, and Wiring:

1. Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
2. Electrical Connection: 115 V, single phase, 60 Hz or 24 V, 60 Hz.

2.4 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

1. Greenheck Fan Corporation.
2. Pottorff.
3. Ruskin Company.
4. Or approved equal.

B. Type: dynamic; rated and labeled in accordance with UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000 fpm velocity.

D. Fire Rating: 1-1/2 hours.

E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed galvanized steel; with mitered and interlocking corners; gauge in accordance with UL listing.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel; gauge in accordance with UL listing.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed galvanized sheet steel, interlocking full-length steel blade connectors. Material gauge is to be in accordance with UL listing.

I. Horizontal Dampers: Include blade lock and stainless steel closure spring.

J. Heat-Responsive Device:

1. Replaceable, 165 deg F rated, fusible links.

2.5 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

1. Greenheck Fan Corporation.
2. Pottorff.
3. Ruskin Company.
4. Or approved equal.

B. General Requirements:

1. Label to indicate conformance to UL 555 and UL 555S by an NRTL.
2. Label to indicate conformance to NFPA 80 and NFPA 90A by an NRTL.
3. Unless otherwise indicated, use parallel-blade configuration.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000 fpm velocity.

D. Fire Rating: 1-1/2 hours.

E. Smoke Detector: Integral, factory wired for single-point connection.

F. Performance:

1. AMCA Certification: Test and rate in accordance with AMCE Publication 511.
2. Leakage:

a. Class IA: Leakage shall not exceed 3 cfm/sq. ft. against 1-inch wg differential static pressure.

3. Pressure Drop: 0.05 in. wg at 1500 fpm across a 24-by-24-inch damper when tested in accordance with AMCA 500-D, Figure 5.3.
4. Velocity: Up to 3000 fpm.
5. Temperature: Minus 25 to plus 180 deg F.
6. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.

G. Construction:

1. Suitable or horizontal or vertical airflow applications.
2. Linkage out of airstream.
3. Frame:

    a. Hat shaped.
    b. Galvanized sheet steel, with welded corners and mounting flange.
    c. Gauge is to be in accordance with UL listing.

4. Blades:

    a. Roll-formed, horizontal, airfoil, extruded aluminum.
    b. Maximum width and gauge in accordance with UL listing.

5. Blade Edging Seals:

    a. Silicone rubber.

6. Blade Jamb Seal: Flexible stainless steel, compression type.
7. Blade Axles: 1/2-inch-diameter; stainless steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings. Linkage mounted out of airstream.
8. Bearings:

    a. Oil-impregnated stainless steel sleeve.

H. Mounting Sleeve:

1. Factory installed, galvanized sheet steel.
2. Length to suit wall or floor application with factory-furnished silicone caulking.
3. Gauge in accordance with UL listing.

I. Heat-Responsive Device:

1. Electric resettable link and switch package, factory installed, rated.

J. Master control panel for use in dynamic smoke-management systems.

K. Damper Actuator - Electric:

1. Electric - 120 V ac or 24 V ac.
2. UL 873, plenum rated.
3. Designed to operate in smoke-control systems complying with UL 555S requirements.
4. Two position or fully modulating with fail-safe spring return as shown on the drawings.

a. Sufficient motor torque and spring torque to drive damper fully open and fully closed with adequate force to achieve required damper seal.
b. Maximum 15-second full-stroke closure.
c. Minimum 90-degree drive rotation.

5. Clockwise or counterclockwise drive rotation as required for application.
6. Environmental Operating Range:

a. Temperature: Minus 40 to plus 130 deg F.
b. Humidity: 5 to 95 percent relative humidity noncondensing.

7. Environmental Enclosure: NEMA 1 and suitable for plenum return application.
8. Actuator to be factory mounted and provided with single-point wiring connection.

L. Controllers, Electrical Devices, and Wiring:

1. Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
2. Electrical Connection: 115 V, single phase, 60 Hz or 24 V, 60 Hz Insert values.

M. Accessories:

1. Auxiliary switches for signaling, fan control or position indication.
2. Test and reset switches, remote mounted.

2.6 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. DynAir; a Carlisle Company.
4. Or approved equal.

B. Description: Add-on or roll-formed, factory fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel for unpainted ducts or Galvannealed steel for painted ducts.

D. Gauge, Shape, Bolts and Accessories: Match connecting ductwork.

2.7 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

1. Aero-Dyne Sound Control Co.

2. CL WARD & Family Inc.
3. Ductmate Industries, Inc.
4. Or approved equal.

B. Manufactured Turning Vanes for Metal Ducts: Fabricate curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

D. Vane Construction:

1. Double wall.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

1. Aire Technologies.
2. Arrow United Industries.
3. Cesco Products; a division of MESTEK, Inc.
4. Or approved equal.

B. Duct-Mounted Access Doors: Fabricate access panels in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 7-2 (7-2M), "Duct Access Doors and Panels," and Figure 7-3, "Access Doors - Round Duct."

1. Door, Double Wall for Unpainted Ducts:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. 24-gauge-thick galvanized steel door panel.
d. Vision panel.
e. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
f. Fabricate doors airtight and suitable for duct pressure class.

2. Door, Single Wall for Painted Ducts:

a. Single wall, rectangular.
b. Galvannealed sheet metal and thickness as indicated for duct pressure class.
c. 24-gauge-thick galvannealed steel door panel.
d. Vision panel.
e. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
f. Fabricate doors airtight and suitable for duct pressure class.

3. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

    a. 24-gauge-thick galvanized steel or 0.032-inch-thick aluminum frame.

4. Number of Hinges and Locks:

    a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
    c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.
    d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

2.9 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. Or approved equal.

B. Fire-Performance Characteristics: Adhesives, sealants, fabric materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested in accordance with ASTM E84.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Materials: Flame-retardant or noncombustible fabrics.

E. Coatings and Adhesives: Comply with UL 181, Class 1.

F. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

G. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

H. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.10 DUCT ACCESSORY HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. Or approved equal.

B. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

C. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.11 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A653/A653M.

1. Steel Sheet, Zinc-Coated
2. Galvanized Coating Designation: G90
3. Finishes for Surfaces Exposed to View: Mill phosphatized.

B. Galvannealed Sheet Steel: Comply with ASTM A653/A653M.

1. Steel Sheet, Zink-Iron Alloy-Coated
2. Galvannealed Coating Designation: A60.
3. Finishes for Surfaces Exposed to View: Spangle-free.

C. Aluminum Sheets: Comply with ASTM B209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, one-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories in accordance with applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116 for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless steel accessories in stainless steel ducts, and aluminum accessories in aluminum ducts.

C. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Where multiple damper sections are necessary to achieve required dimensions, provide reinforcement to fully support damper assembly when fully closed at full system design static pressure.

E. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install aluminum volume dampers in aluminum ducts.

F. Set dampers to fully open position before testing, adjusting, and balancing.

G. Install test holes at fan inlets and outlets and elsewhere as indicated and as needed for testing and balancing.

H. Install fire and smoke dampers in accordance with UL listing.

I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream and downstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-ft. spacing.

8. Upstream and downstream from turning vanes.
9. Control devices requiring inspection.
10. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

L. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. For fans developing static pressures of 5 inches wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Install duct test holes where required for testing and balancing purposes.

P. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors, and verify that size and location of access doors are adequate to perform required operation.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation, and verify that vanes do not move or rattle.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 233346 - FLEXIBLE DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Insulated flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For flexible ducts.

1. Include plans showing locations and mounting and attachment details.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from installers of the items involved.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."

D. Comply with ASTM E96/E96M, "Test Methods for Water Vapor Transmission of Materials."

2.2 INSULATED FLEXIBLE DUCTS

A. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.

1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 175 deg F.
4. Insulation R-Value: Comply with ASHRAE/IES 90.1 but not less than R6.

2.3 FLEXIBLE DUCT CONNECTORS

A. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.

C. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

D. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.

E. Install duct test holes where required for testing and balancing purposes.

F. Installation:

1. Install ducts fully extended.
2. Do not bend ducts across sharp corners.
3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
5. Install flexible ducts in a direct line, without sags, twists, or turns.

G. Supporting Flexible Ducts:

1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.

4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION 233346

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 233416 - CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof mounted centrifugal fans.
2. Wall mounted propeller fans
3. In-line square centrifugal fans

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
2. Rated capacities, operating characteristics, and furnished specialties and accessories.
3. Certified fan performance curves with system operating conditions indicated.
4. Certified fan sound-power ratings.
5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
6. Material thickness and finishes, including color charts.
7. Dampers, including housings, linkages, and operators.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Fan room layout and relationships between components and adjacent structural and mechanical elements, drawn to scale, and coordinated with each other, using input from installers of the items involved.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For centrifugal fans to include in normal operation, emergency operation, and maintenance manuals with replacement parts listing.

1.6 WARRANTY

A. Manufacturer agrees to repair or replace components of the equipment that fail in materials or workmanship within specified warranty period as it stated below.

1. The warranty shall include parts and labor costs.

2. Warranty Period: Two years from date of Substantial Completion.

1.7 SPARE PARTS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 ROOF MOUNTED CENTRIFUGAL EXHAUST FANS

A. Roof mounted exhaust fans shall be centrifugal belt or direct drive type. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

B. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure. The fan shroud shall have a rolled bead for added strength.

C. Motors shall be heavy duty ball bearing type, carefully matched to the fan load, and furnished with the specified voltage, phase and enclosure. Motors and drives shall be mounted on vibration isolators, out of the airstream. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance.

D. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators.

E. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Drives shall be sized for a minimum of 150 percent of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor pulleys shall be adjustable for final system balancing.

F. A fan conduit chase shall be provided through the curb cap to the motor compartment for ease of installation.

G. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

H. Fans shall be provided with 14" high, 1-1/2" thick insulated prefabricated heavy gauge aluminum roof curb, motor operated dampers with end switches, hinged curb cap for damper access section.

I. Fans shall be manufactured by Greenheck Fan Corporation of Schofield, Loren Cook, Wisconsin, or approved equal.

2.2 WALL MOUNTED PROPELLER FANS

A. Type: Wall mounted, propeller supply fan.

B. Capacity: As specified in the Equipment Schedule on the Contract Drawings.

C. Construction: Steel Wall Fan:
   1. Propellers:
      a. Airfoil design.
      b. Cast aluminum alloy or heavy gauge steel material.
      c. Statically and dynamically balanced.
      d. Six blades.
      e. Propellers equipped with malleable iron split taper bushing for alignment and locking of propeller to the shaft.
         1) Bushing held in place by compression and keyed to the shaft to prevent slipping or loosening.
         2) Positioned with three standard cap screws for easy assembly and disassembly.
   2. Venturi and Panel:
      a. Heavy gauge steel.
      b. Designed for airfoil propellers.
   3. Safety Guard:
      a. 1/2 inch by 1/2 inch PVC coated mesh wire screen that meets OSHA standards.
      b. Removable sections to provide for easy access to motor.
   4. Damper: Motorized damper with end switch.

D. Accessories:
   1. All structural steel used for mounting fans shall be corrosion resistant coated. Mounting hardware shall be steel.

2. The Contractor to provide additional stiffeners, angles and supports as required to mount the fans.

E. Drive:
1. Direct or belt drive as shown on the Contract Drawings.
2. OSHA approved guard.

F. Painting:
1. Propellers shall be factory coated with a 4 coat baked phenolic coating system minimum of 2 to 3 mils dry film thickness total, of Heresite Series P-413 or approved equal.

G. Fans shall be manufactured by Greenheck Fan Corporation of Schofield, Loren Cook, Wisconsin, or approved equal.

2.3 IN-LINE SQUARE CENTRIFUGAL FANS

A. In-line square fans shall be of the centrifugal belt driven or directly driven in-line type, as indicated on the fan schedule. The fan housing shall be of the square design constructed of minimum 18 gauge galvanized steel with integral duct mounting collars.

B. Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.

C. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

D. Motors and drives shall be mounted out of the airstream with combination motor cover and belt guards. Motors shall be readily accessible for maintenance.

E. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings.

F. Drives shall be sized for a minimum of 150 percent of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor pulleys shall be adjustable for system balancing.

G. Fans shall be manufactured by Greenheck Fan Corporation of Schofield, Loren Cook, Wisconsin, or approved equal.

2.4 SOURCE QUALITY CONTROL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

B. AMCA Compliance: Fans shall comply with AMCA 11 and bear the AMCA-Certified Ratings Seal.

C. Fan Sound Ratings: Comply with AMCA 311 and label fans with the AMCA-Certified Ratings Seal. Sound ratings shall comply with AMCA 301. The fans shall be tested according to AMCA 300.

D. Fan Performance Ratings: Comply with AMCA 211 and label fans with AMCA-Certified Rating Seal. The fans shall be tested for air performance - flow rate, fan pressure, power, fan efficiency, air density, speed of rotation, and fan efficiency - according to AMCA 210/ASHRAE 51.

E. Operating Limits: Classify fans according to AMCA 99.

PART 3 - EXECUTION

3.1 INSTALLATION OF CENTRIFUGAL HVAC FANS

A. Install centrifugal fans level and plumb.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

D. Equipment Mounting:

1. Support duct-mounted and other hanging centrifugal fans directly from the building structure, using suitable hanging systems as specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

E. Comply with requirements for vibration isolation devices specified in Division 23 Specification Sections.

F. Install units with clearances for service and maintenance.

G. Label fans according to requirements specified in Division 23 Specification Sections.

3.2 DUCTWORK CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Specification Sections.

B. Install ducts adjacent to fans to allow service and maintenance.

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring according to Division 26 Specification Sections.

B. Ground equipment according to Division 26 Specification Sections.

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

1. Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Division 26 Specification Sections.
2. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.4 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Division 26 Specification Sections.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that there is adequate maintenance and access space.
4. Verify that cleaning and adjusting are complete.
5. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, and install guards as per OSHA requirements.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. See Section 230593 "Testing, Adjusting, and Balancing For HVAC" for testing, adjusting, and balancing procedures.
10. Remove and replace malfunctioning units and retest as specified above.

D. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans.

END OF SECTION 233416

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 233600 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single duct variable or constant volume terminal units.

B. Related Sections:

1. Section 230513 - Common Motor Requirements for HVAC Equipment
2. Section 230900 – Direct Digital Controls (DDC) System for HVAC.
3. Section 233113 – Metal Ducts
4. Section 233300 – Air duct Accessories

1.2 REFERENCES

A. American Refrigeration Institute:

1. ARI 880 - Air Terminals.
2. ARI 885 -Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.

B. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

D. Underwriters Laboratories Inc.:

1. UL 181 - Factory-Made Air Ducts and Connectors.

1.3 SUBMITTALS

A. Product Data: Submit data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings indicating airflow, static pressure, heating coil capacity and NC designation. Include electrical characteristics and connection requirements. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 1 inch to 4 inches wg.

B. Manufacturer's Installation Instructions: Submit support and hanging details, and service clearances required.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.

1.5 QUALITY ASSURANCE

A. Test and rate air terminal units performance for air pressure drop, flow performance, and acoustical performance in accordance with ARI 880 and ARI 885. Attach ARI seal to each terminal unit.

B. Perform Work in accordance with State or Municipality standards.

C. Maintain one copy copies of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section.

B. Installer: Company specializing in performing Work of this section.

1.7 WARRANTY

A. Provide manufacturer's parts warranty for one year from unit start-up or eighteen months from unit shipment, whichever is shorter.

PART 2 - PRODUCTS

2.1 SINGLE DUCT VARIABLE OR CONSTANT VOLUME AIR TERMINAL UNITS

2.2 MANUFACTURERS:

1. Trane
2. Price Industry
3. Environmental Technologies Inc.
4. Or approved equal

2.3 MANUFACTURED MODELS

A. Single duct terminal units.

1. Ceiling mounted primary air control terminal units for connection to a single 5 in. w.g. maximum pressure duct of a central air distribution system. Terminals units may be provided with controls and integral heating coils.
2. Identify each terminal unit with clearly marked identification label and airflow indicator. Label shall include unit nominal air flow, maximum factory-set air flow, minimum factory-set air flow, and coil type.

2.4 FABRICATION

A. Casings: Units shall be completely factory-assembled, manufactured of corrosion protected steel, and fabricated with a minimum of 22-gauge metal on the high pressure (inlet) side of the terminal unit damper and 22-gauge metal on the low pressure (outlet) side and unit casing.

B. Insulation: Foil Faced - The interior surface of unit casing is acoustically and thermally lined with a minimum of 1-inch, 1.0 lb/ft3 density glass fiber with foil facing. Minimum insulation R-Value of 3.85. The interior foil liner shall isolate the fiberglass insulation from the airstream and allow for cleaning of the terminal unit interior surfaces. Insulation shall meet NFPA-90A, UL 181 and bacteriological standard ASTM C 665. The cut edges on the discharge of the unit shall be covered by a metal flange. There are no exposed edges of insulation (complete metal encapsulation).

C. Assembly: Primary air control damper, airflow sensor, controls and heating coil in single assembly.

D. Rectangular Supply Air Outlet Connections: Rectangular outlet connections for units without heating coils on the outlet of the terminal unit shall be flange type. Rectangular outlet connections for units with heating coils on the outlet of the terminal unit shall be slip and drive type.

2.5 PRIMARY AIR CONTROL DAMPER ASSEMBLY

A. Construct damper assembly from a minimum of 18 gauge galvanized steel on the primary air side of the terminal. Blade shall incorporate a full closed cell damper seal to minimize leakage. Damper blade shall be a minimum of 0.10 in. thickness. Maximum damper leak rate shall not exceed 1% of damper nominal CFM at 4 in. wg. differential pressure.

B. Damper assembly shall be constructed self-lubricating bearings and contain a mechanical stop.

C. Primary Damper Shaft shall have a position indicator stamped on the end of the shaft to identify damper position without disassembly of duct, unit casing, or removal of the control box cover.

D. Provide damper assembly with integral flow sensor. Flow sensor shall be provided regardless of control type. Flow sensor shall be a 16-point (minimum 8-points on high pressure side and 8-points on low pressure side), averaging ring or cross type. Bar or single point sensing type is not acceptable. Damper assembly shall be capable of maintaining airflow to within +/- 5 percent of rated unit airflow setpoint with 1.5 duct diameters straight duct upstream from the unit.

E. Flow sensor transducer shall not be integral to the unit controller.

F. Flow coefficient calibration data shall be provided for each terminal unit at or near the unit inlet.

G. Integral flow sensor pressure transducer shall be pressure tested, with air, prior field installation.

2.6 WIRING

A. Factory install and wire terminal unit. Install electrical components in control box with removable cover. Incorporate single point electrical connection to power source.

B. Disconnect switch - Provide terminal units with a factory installed and wired switch to disconnect power to the unit.

C. Power Line Fuse - Provide single and dual duct terminal units with integral power line fusing installed in the control box to prevent overcurrent damage to the unit.

D. Control Transformer - Provide terminal units with a factory installed and wired 24 VAC transformer to provide control voltage power to the unit.

2.7 TESTING / VERIFICATION

A. Maximum Casing Leakage: 1 percent of nominal air flow at 0.5 in wg inlet static pressure.

B. Maximum Damper Leakage: 1 percent of design air flow at 4 in wg inlet static pressure.

2.8 ACCESSORIES:

A. The air terminal unit manufacturer provides unit mounter control panel.

B. A terminal strip shall be provided by the air terminal unit manufacturer for the BAS contractor to mount and integrate the DDC controls.

C. BAS Contractor to provide Controls / Controller (BACnet/IP) and space temperature sensor.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify ductwork is ready for air terminal installation.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Connect to ductwork in accordance with Section 233113.

C. Install ceiling access doors or locate units above easily removable ceiling components.

D. Support units individually from structure. Do not support from adjacent ductwork.

E. Support air terminal units connected by flexible duct independently of flexible duct.

F. Install transition piece to match flexible duct size to inlet or outlet of variable air volume terminal.

3.3 ADJUSTING

A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design air flow to 25 percent nominal air flow for cooling only units and 30 percent for units with heating coils.

END OF SECTION 233600

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 233713.13 - AIR DIFFUSERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.
2. Section 233713.23 "Air Registers and Grilles" for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified. Actual size of smallest diffuser indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 RECTANGULAR AND SQUARE CEILING DIFFUSERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Krueger-HVAC, a division of Air System Components; Johnson Controls, Inc.
2. Price Industries.
3. Titus, a division of Air System Components; Johnson Controls, Inc.
4. Or approved equal

B. Devices shall be specifically designed for variable-air-volume flows.

C. Material: Aluminum.

D. Finish: Baked enamel, color selected by Architect.

E. Face Size: 24 by 24 inches.

F. Face Style: Plaque.

G. Mounting: T-bar.

H. Pattern: Fixed.

I. Dampers: Combination damper and grid.

J. Accessories:

1. Insulated backpan

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.13

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 233713.23 - REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed face registers.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to registers and grilles.
2. Section 233713.13 "Air Diffusers" for various types of air diffusers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Register and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified. Smallest size register and grille indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 REGISTERS

A. Fixed Face Register:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

    a. A-J Manufacturing Co., Inc.
    b. Anemostat Products; a Mestek company.
    c. Hart & Cooley Inc.
    d. Krueger-HVAC, a division of Air System Components; Johnson Controls, Inc.
    e. Price Industries.
    f. Titus, a division of Air System Components; Johnson Controls, Inc.
    g. Or approved equal

2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
5. Face Arrangement: Perforated core.
6. Core Construction: Removable.
7. Frame: 1 inch wide.
8. Mounting: Lay in.
9. Damper Type: Adjustable opposed blade.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate registers and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where registers and grilles are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install registers and grilles level and plumb.

B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements

for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.23

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 233723 - HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Louvered-penthouse ventilators.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. For louvered-penthouse ventilators specified to bear AMCA seal, include printed catalog pages, showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For gravity ventilators.

1. Include plans, elevations, sections, details, ventilator attachments to curbs, and curb attachments to roof structure.
2. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

C. Delegated-Design Submittal: For shop-fabricated ventilators indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of shop-fabricated ventilators.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof-framing plans and other details, drawn to scale, and coordinated with each other, based on input from installers of the items involved:

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 WARRANTY

A. Manufacturer agrees to repair or replace components of air terminal units that fail in materials or workmanship within specified warranty period as it stated below.

1. The warranty shall include parts and labor costs.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ventilators.

B. Structural Performance: Ventilators shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of ventilator components, noise or metal fatigue caused by ventilator blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
2. Snow Load: Unit to withstand a minimum of 20-lbf/sq. ft. snow load.

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1.

D. ASHRAE 62.1 Compliance: Section 5, "Systems and Equipment" and Section 7, "Construction and System Start-up."

E. Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

2.2 FABRICATION

A. Factory or shop fabricate gravity ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.

D. Fabricate supports, anchorages, and accessories required for complete assembly.

E. Perform shop welding by AWS-certified procedures and personnel.

2.3 LOUVERED-PENTHOUSE VENTILATORS

A. Description: Multitier rectangular louvered penthouse for relief air.

B. Manufacturers: Basis of design: GREENHECK

C. Approved manufacturers:
1. Arrow United Industries.
2. Ruskin Company
3. Loren Cook Company
4. Or approved equal

D. Source Limitations: Obtain louvered-penthouse ventilators from single manufacturer.

E. Construction:

1. Material: All-welded assembly with 4-inch-deep louvers, mitered corners, and aluminum sheet roof.
2. Frame and Blade Material: Extruded aluminum, of thickness required to comply with structural performance requirements, but not less than 0.080 inch for frames and 0.080 inch for blades.
3. Insulation: Mineral-fiber insulation and vapor barrier
4. Wind-Driven Rain Performance: Not less than **99** percent effectiveness when subjected to a rainfall rate of 3 inches per hour and a wind speed of 29 mph at a free-area intake velocity of 300 fpm.
5. AMCA Seal: Mark units with the AMCA Certified Ratings Seal.
6. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.
7. Bird Screening: Aluminum, 1/2-inch- square mesh.
8.

F. Roof Curbs: Aluminum; with mitered and welded corners; 1-1/2-inch thick, rigid fiberglass insulation adhered to inside walls. Size as required to fit roof opening and ventilator base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 14 inches**.**

2.4 MATERIALS

A. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming or as otherwise recommended by metal producer for required finish.

B. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.

C. Post-Installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors made from stainless-steel components, with capability to sustain without failure a load equal to 4 times the loads imposed for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.

B. Secure gravity ventilators to roof curbs with zinc-plated hardware **,** that comply with the wind and vibration fastening requirements. Use concealed anchorages where possible.

C. Install gravity ventilators with clearances for service and maintenance.

D. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses.

F. Label gravity ventilators according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

H. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes, so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in Section 233113 "Metal Ducts". Drawings indicate general arrangement of ducts and duct accessories.

END OF SECTION 233723

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 233723 – LOUVERED-PENTHOUSE VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Louvered-penthouse ventilators.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. For louvered-penthouse ventilators specified to bear AMCA seal, include printed catalog pages, showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For gravity ventilators.

1. Include plans, elevations, sections, details, ventilator attachments to curbs, and curb attachments to roof structure.
2. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

C. Delegated-Design Submittal: For shop-fabricated ventilators indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of shop-fabricated ventilators.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof-framing plans and other details, drawn to scale, and coordinated with each other, based on input from installers of the items involved:

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 WARRANTY

A. Manufacturer agrees to repair or replace components of air terminal units that fail in materials or workmanship within specified warranty period as it stated below.

1. The warranty shall include parts and labor costs.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ventilators.

B. Structural Performance: Ventilators shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of ventilator components, noise or metal fatigue caused by ventilator blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
2. Snow Load: Unit to withstand a minimum of 20-lbf/sq. ft. snow load.

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1.

D. ASHRAE 62.1 Compliance: Section 5, "Systems and Equipment" and Section 7, "Construction and System Start-up."

E. Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

2.2 FABRICATION

A. Factory or shop fabricate gravity ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.

D. Fabricate supports, anchorages, and accessories required for complete assembly.

E. Perform shop welding by AWS-certified procedures and personnel.

2.3 LOUVERED-PENTHOUSE VENTILATORS

A. Description: Multitier rectangular louvered penthouse for relief air.

B. Manufacturers: Basis of design: GREENHECK

C. Approved manufacturers:
1. Arrow United Industries.
2. Ruskin Company
3. Loren Cook Company
4. Or approved equal

D. Source Limitations: Obtain louvered-penthouse ventilators from single manufacturer.

E. Construction:

1. Material: All-welded assembly with 4-inch-deep louvers, mitered corners, and aluminum sheet roof.
2. Frame and Blade Material: Extruded aluminum, of thickness required to comply with structural performance requirements, but not less than 0.080 inch for frames and 0.080 inch for blades.
3. Insulation: Mineral-fiber insulation and vapor barrier
4. Wind-Driven Rain Performance: Not less than **99** percent effectiveness when subjected to a rainfall rate of 3 inches per hour and a wind speed of 29 mph at a free-area intake velocity of 300 fpm.
5. AMCA Seal: Mark units with the AMCA Certified Ratings Seal.
6. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.
7. Bird Screening: Aluminum, 1/2-inch- square mesh.
8.

F. Roof Curbs: Aluminum; with mitered and welded corners; 1-1/2-inch thick, rigid fiberglass insulation adhered to inside walls. Size as required to fit roof opening and ventilator base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 14 inches**.**

2.4 MATERIALS

A. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming or as otherwise recommended by metal producer for required finish.

B. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.

C. Post-Installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors made from stainless-steel components, with capability to sustain without failure a load equal to 4 times the loads imposed for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.

B. Secure gravity ventilators to roof curbs with zinc-plated hardware **,** that comply with the wind and vibration fastening requirements. Use concealed anchorages where possible.

C. Install gravity ventilators with clearances for service and maintenance.

D. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses.

F. Label gravity ventilators according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

H. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes, so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in Section 233113 "Metal Ducts". Drawings indicate general arrangement of ducts and duct accessories.

END OF SECTION 233723

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 237433- PACKAGED, DEDICATED OUTDOOR AIR UNITS (DOAS)

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes packaged, rooftop dedicated outdoor air units (DOAS) and accessories.

B. Related Sections:

1. Section 230513 - Common Motor Requirements for HVAC.
2. Section 230548 – Vibration and Wind Controls for HVAC.
3. Section 230900 – Direct Digital Controls (DDC) System for HVAC.
4. Section 232113 - Hydronic Piping
5. Section 233113 – Metal Ducts

1.2 REFERENCES

A. American Bearing Manufacturers Association:

1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

B. Air Movement and Control Association International, Inc.:

1. AMCA 99 - Standards Handbook.
2. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
3. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
4. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
5. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

C. Air-Conditioning and Refrigeration Institute:

1. ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.
2. ARI 430 - Central-Station Air-Handling Units.
3. ARI Guideline D - Application and Installation of Central Station Air-Handling Units.

D. ASTM International:

1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

E. National Electrical Manufacturers Association:

1. NEMA MG 1 - Motors and Generators.

F. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

G. Underwriters Laboratories Inc.:

1. UL 900 - Air Filter Units.
2. UL - Fire Resistance Directory.

1.3 SUBMITTALS

A. No equipment shall be fabricated or delivered until the receipt of approved shop drawings from the Engineers or Owner's approved representative.

B. DOAS manufacturer shall provide the following information with each shop drawing/product data submission:
1. Dimensioned arrangement drawings for each DOAS including a plan and elevation view of the assembled unit with overall dimensions, lift points, unit shipping split locations and dimensions, installation and operating weights, and installation, operation and service clearances.
2. All electrical, piping, and ductwork requirements, including sizes, connection locations, and connection method recommendations.
3. Each component of the unit shall be identified and mechanical specifications shall be provided for unit and accessories describing construction, components, and options.
4. All performance data, including capacities and airside and waterside pressure drops, for components.
5. Fan curves shall be provided for fans with the design operating points indicated. Data shall be corrected to actual operating conditions, temperatures, and altitudes.
6. For units utilizing multiple fans in a fan section, a fan curve shall be provided showing the performance of the entire bank of fans at design conditions. In addition, a fan curve shall be provided showing the performance of each individual fan in the bank of fans at design conditions. Also a fan curve shall be provided showing the performance of the bank of fans, if one fan is down. The percent redundancy of the bank of fans with one fan down shall be noted on the fan curve or in the tabulated fan data.
7. A filter schedule must be provided by the DOAS unit manufacturer. Schedule shall detail unit tag, unit size, corresponding filter section location within the DOAS, filter arrangement (e.g. angled/flat), filter depth, filter type (e.g. pleated media), MERV rating, and filter quantity and size.
8. A schedule detailing necessary trap height shall be provided for each air handling unit. Schedule shall detail unit tag, unit size, appropriate trap schematic with recommended trap dimensions, and unit supplied base rail height. Contractor shall be responsible for additional trap height required for trapping and insulation beyond the unit supplied base rail height by adequate housekeeping pad.
9. A coil valve coordination schedule shall be provided for each air handling unit supplied by the air handling unit manufacturer. Schedule shall detail unit tag, coil type and corresponding section location within the DOAS, valve style (e.g. global, ball), valve type (e.g. electronic 2-way/3-way), valve position (e.g. normally open/closed), size, flow coefficient (CV), and close-off pressure.
10. An electrical MCA - MOP schedule shall be provided for each electrical circuit to which field-power must be supplied. Schedule to detail unit tag, circuit description, voltage/phase/hertz, Minimum Circuit Ampacity (MCA), and calculated Maximum Overcurrent Protection (MOP).

11. Sound data shall be provided using AHRI 260 test methods. Unit discharge, inlet, and radiated sound power levels in dB shall be provided for 63, 125, 250, 500, 1000, 2000, 4000 and 8000Hz.
12. The DOAS manufacturer shall provide appropriate sets of submittals as referenced in the General Conditions and shall submit to the Owner electronic copies of the IOM.
13. The DOAS manufacturer shall list any exceptions to the specification.
14. Only request submittals needed to verify compliance with Project requirements.
16. Manufacturer's Installation Instructions: Submit.
17. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.5 QUALITY ASSURANCE

A. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with current AHRI Standard 410.

B. Units with fan sections utilizing single fans shall be rated and certified in accordance with AHRI Standard.

C. Units with fan sections utilizing multiple fans shall be rated in accordance with AHRI Standard 430 for airflow, static pressure, and fan speed performance.

D. Airflow monitoring station: Certify airflow measurement station performance in accordance with AMCA 611.

E. ISO 9001 Certification.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section.

B. Installer: Company specializing in performing Work of this section.

1.7 REGULATOR REQUIREMENTS

A. Agency Listings/Certifications

1. Unit shall be manufactured to conform to UL and shall be listed by either UL/CUL or ETL. Units shall be provided with listing agency label affixed to the unit. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his/her expense, provide for a field inspection by a UL/CUL or ETL representative to verify conformance. If necessary, contractor shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the owner.

2. Certify DOAS unit in accordance with AHRI Standard 430. Units shall be provided with certification label affixed to the unit. If air handling units are not certified or fans are not rated in accordance with AHRI Standard 430 contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
3. Certify air handling coils in accordance with AHRI Standard 410. Units shall be provided with certification label affixed to the unit. If air handling coils are not certified in accordance with AHRI Standard 410, contractor shall be responsible for expenses associated with testing of coils after installation to verify performance of coil(s). Any costs incurred to adjust coils to meet scheduled capacities shall be the sole responsibility of the contractor.
4. Certify airflow monitoring stations are tested for differential pressure in accordance with AMCA 611 in an AMCA registered laboratory and comply with the requirements of the AMCA Certified Ratings Program. Airflow monitoring station shall be licensed to bear the AMCA Seal.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Shipping splits shall be clearly defined on submittal drawings. Cost associated with non-conformance to shop drawings shall be the responsibility of the manufacturer. Each section shall have lifting lugs for field rigging, lifting and final placement of DOAS section(s). DOAS's less than 100-inches wide shall allow for forklift transport and maneuverability on the jobsite.

C. Deliver units to jobsite with fan motor(s), sheave(s), and belt(s) completely assembled and mounted in units.

D. Unit shall be shipped in a clear shrink-wrap or stretch-wrap to protect unit from in-transit rain and debris per ASHRAE 62.1 recommendations.

E. Installing contractor shall be responsible for storing DOAS in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.9 START-UP AND OPERATING REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated (if applicable), condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.

1.10 WARRANTY

A. Manufacturer agrees to repair or replace components of DOAS unit that fail in materials or workmanship within specified warranty period as it stated below.

1. 1-year manufacturer parts warranty: 12-months from date of unit start-up or 18-months from unit ship date, whichever is less.
2. Provide twenty-five-year heat exchanger limited warranty from unit ship date.
3. 5-year compressor warranty for units 25 tons and below.

PART 2 - PRODUCTS

2.1 DOAS UNITS

A. Approved Manufacturers:
1. TRANE
2. Munters
3. Seadons-4
4. Or approved equal

B. Bases of Design: TRANE or approved equal. Unit layout and configuration shall be as defined in project plans and schedules. Fabrication shall conform to AMCA 99 and ARI 430.

2.2 Roof Curb

A. Delegated-Design: For each wind rated noise reductive spring isolation rood curb.

1. Design, fabrication and installation of the wind rated noise reductive spring isolation rood curbs shall be in compliance with the Specification Section 230548 “Vibration and Wind Controls for HVAC”.

2.3 UNIT CONSTRUCTION

A. General Description

1. The air source heat pump DOAS unit shall include compressors, evaporator coils, filters, supply fans, dampers, air-cooled condenser coils, condenser fans, reheat coil, exhaust fans, energy recovery wheels.
2. All controls shall be provided by the unit manufacturer.
3. The unit shall be configured at the factory to downflow discharge for both Supply and Return/Exhaust Openings. Cooling performance shall be rated in accordance with ARI testing procedures.
4. All units shall be factory assembled, internally wired, fully charged with R-410A, and 100 percent run tested to check cooling operation, fan and blower rotation, and control sequence before leaving the factory. Wiring internal to the unit shall be colored and

numbered for simplified identification. Units shall be ETL listed and labeled, classified in accordance to UL 1995/CAN/CSA No. 236-M40 for Central Cooling Air Conditioners.

5. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
6. Unit components shall be labeled, including refrigeration system components, and electrical components.
7. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
8. Installation, Operation, and Maintenance manual shall be supplied within the unit.
9. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

B. General Unit Configuration and Accessories

1. Airflow Configuration: Vertical Discharge/Vertical Return
2. Installation: Outdoor ASHP
3. Evaporator Coil: DX 4 Row Interlaced
4. Hot Gas Reheat: Modulating
5. Compressor: Digital Scroll Primary Circuit
6. Condenser: Air Cooled Variable Speed Head Pressure Low Ambient Control
7. Indoor Blower Motor: Direct Drive w/VFD
8. Heat Type: Electric - SCR Modulating
9. Fuel Type: Electric - Open Coil
10. 208-3V Electric Heater: 20
11. Unit Controls: Trane UC600 - Discharge Air Control w/BACNET w/Display
12. Powered Exhaust: Direct Drive w/VFD & Gravity Damper
13. ERV/HRV: ERV - Aluminum Construction w/ Bypass Dampers
14. Energy Recovery & Conservation: ERC-3018C-4M
15. Damper: 2-Position Outdoor and Exhaust ir Dampers
16. Filters: MERV-8 & MERV-13
17. Electrical Options: Non-Fused Disconnect Switch "Circuit Breaker" w/ 115v Outlet (B/G)
18. Air Flow Monitoring: IFM Piezo Ring and PE Piezo Ring/Tap
19. Accessories: Condenser Hailguard
20. Curb: Aux Mod 2" Vibration Isolation (Includes Curb)
21. Warranty: 1-Year Parts Only (manufacturer warranty)
22. Warranty: 5-Year Digital/Variable Speed Scroll Compressor
23. Supply Discharge Air Sensor (FLD)
24. 2 inch Double Wall Construction
25. Double Wall 2 in R13 Base Construction
26. Stainless Steel Drip Pan
27. Slide out ERV Wheel for serviceability
28. Slide out Supply fan for serviceability
29. Systems integration – systems controls integrated to SC+ via UC600
30. Modulating Hot Gas Reheat w/ 6" Gap from Evaporator Coil
31. Auto Restart
32. SS Drain Pan below compressors
33. Entire cabinet exterior pre-painted

C. Casing

1. All cabinet walls, access doors, and roof shall be fabricated of double wall foamed panel with thermal break construction throughout the indoor section of unit to provide nonporous, cleanable interior surfaces. All interior seams exposed to airflow shall be sealed.
2. Insulation: Unit shall have 2 inch thick polyisocyanurate or 2" polyurethane injected foam metal encapsulated with no exposed edges. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.
3. Cabinet Base Rails: Side and end base rails shall include openings for forklift and tie-down access. To protect unit base from fork damage side rails shall include removable heavy gauge fork pockets.
4. Shipping anchors attach to and/or through unit base rails. Straps over unit shall not be used to secure unit for shipping.
5. Cabinet material interior and base rails: shall be G-90 zinc-coated galvanized steel. Material gauge shall be a minimum of 14-gauge for base rails, 16-gauge for structural members and 20-gauge for access doors and cabinet panels.
6. Exterior Corrosion Protection: Exterior cabinet panels shall be a base coat of G-90 galvanized steel with both exterior and interior surfaces cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be in compliance with ASTM B117 salt spray testing at a minimum of 672-hour duration.
7. Cabinet construction shall provide hinged panels providing easy access for all parts requiring routine service.
8. Cabinet top cover shall be one piece construction or where seams exist, it shall be double-hemmed and gasket-sealed.
9. Hinged Access Panels: Water- and air-tight hinged access panels shall provide access to all areas requiring routine service including air filters, heating section, electrical and control cabinet sections, optional ERV and power exhaust fan section, supply air fan section, evaporator and reheat coil sections. Insulated doors shall be constructed to allow the hinges to be reversed in the field.
10. Hold-open devices shall be factory installed on all hinged front access doors. Chains shall not be used as hold-open devices.
11. Latches with locking hasps or tool operated closure devices shall be factory installed on all hinged access panels.
12. Drain Pan material shall be Type 304 Stainless steel drain and constructed to sloped in two directions to ensure positive drainage with corners exposed to standing water and drain fittings welded liquid tight to prevent leaks. Pan shall have a minimum depth of 2". Base of drain pan shall be insulated with 1" thick foam insulation.
13. Provide openings either on side of unit or through the base for power, control, and gas connections.
14. Cabinet shall include optional interior liner constructed of Type 304 stainless steel with sealed seams.
15. Unit shall be equipped with a 6" filter rack upstream of the evaporator. Frame shall be field-adjustable to match any filter combination specified in the following section.

D. Unit Top

1. The top cover shall be one piece construction or, where seams exist, it shall be double-hemmed and gasket-sealed. The ribbed top adds extra strength and enhances water removal from unit top.

E. Sensors

1. A factory installed combination outdoor air sensor located in the outdoor air hood is designed to sense both outdoor air temperature and relative humidity for use by the microprocessor controller to make required ventilation, cooling, dehumidification and heating decisions. Refer to the Sequence of Operations section of the Installation, Operation and Maintenance manual for detailed unit control and operational modes. A factory installed sensing tube is designed to sense the supply air temperature downstream of the indoor fan section.

F. Evaporator Coil: DX 4 Row Interlaced

1. Internally finned, 5/16 inch copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. Coils shall be leak tested at the factory to ensure the pressure integrity. The evaporator coil shall be leak tested to 500 psig and pressure tested to 500 psig. A Stainless Steel double-sloped condensate drain pan with provision for through the unit wall condensate drain is standard. Evaporator coil will have 4 interlaced rows for superior sensible and latent cooling.
2. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
3. Coils shall be hydrogen or helium leak tested.
4. Coils shall be furnished with factory installed expansion valves.

G. Hot Gas Reheat: Modulating

1. This option shall consist of a modulating hot-gas reheat coil located on the leaving air side of the evaporator coil pre-piped and circuited with a low pressure switch. Refer to the Sequence of Operations section shown in the construction documents for detailed unit control and operational modes.

H. Compressor: Digital Scroll Primary Circuit

1. All units shall have direct-drive, hermetic, digital scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Internal overloads shall be provided with the scroll compressors. Crankcase heaters shall be included. Compressor shall be able to fully modulate from 20%-100%.

I. Condenser: Air Cooled Variable Speed Head Pressure Low Ambient Control

1. (Fin and Tube Coil) - Internally finned, 5/16 inch copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. Coils shall be leak tested at the factory to ensure the pressure integrity. The condenser coil shall be leak tested to 500 psig and pressure tested to 500 psig. The condenser coil shall have a fin design with slight gaps for ease of cleaning. Coils shall be designed for use with R-410A refrigerant. Coils shall be hydrogen or helium leak tested.

2. Outdoor Fans: Shall be direct drive vertical discharge design with low-noise corrosion resistant glass reinforced polypropylene props, powder coated wire discharge guards and

electro-plated motor mounting brackets. Fans shall be statically and dynamically balanced.

3. Condenser fans to be controlled via VFD to maintain adjustable pressure to increase reheat capacity where applicable and low ambient control.

J. Indoor Blower Motor: Direct Drive w/VFD

1. Supply Fan motor shall be direct drive type with factory installed Variable Frequency Drive. All motors shall be thermally protected. All indoor fan motors meet the U.S. Energy Policy Act of 2005 (EPACT). All Fans shall be mounted on rubber vibration isolators, to reduce the transmission of noise.
2. Blowers and motors shall be dynamically balanced and mounted on rubber isolators.
3. Motors shall be premium efficiency TEFC with ball bearings rated for 200,000 hours service with external lubrication points.
4. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

K. 208-3V Electric Heater

1. Heaters shall meet the requirements of the National Electrical Code and shall be listed by Underwriters Laboratories for zero clearance to combustible surfaces and for use with heat pumps and air conditioning equipment. Heating elements shall be open coil, 80% nickel, 20% chromium, Type A resistance wire, Type C alloys containing iron or other alloys are not acceptable. Coils shall be machine crimped into stainless steel terminals extending at least 1" into the air stream and all terminal hardware shall be stainless steel. Coils shall be supported by ceramic bushings staked into supporting brackets. Brackets are not to be spaced more than 4-1/2" apart. Heater frames and terminal boxes shall be corrosion resistant steel. Unless otherwise indicated, the terminal box shall be NEMA 12 construction and shall be provided with a hinged, latching cover. Open coil heaters shall be furnished with an airflow switch, disconnecting contactors, fuses (if over 48 amps), control circuit transformer (with primary fusing on Class I circuits as required), built-in, snap acting, door interlock disconnect switch, and a disk type, automatic reset thermal cutout for primary overtemperature protection. Heaters shall also be furnished with disk type, load-carrying manual reset thermal cutouts, factory wired in series with heater stages for secondary protection. Heat limiters or other fusible overtemperature devices are not acceptable. The modulating heaters, control will be SCR type. Unit shall be suitable for use with Electric Resistance Heat.

L. Unit Controls: Trane UC600 - Discharge Air Control w/BACNET w/Display

1. Unit is completely factory wired with necessary controls and contactor pressure lugs for power wiring. Units will provide an external location for mounting fused disconnect device. PLC controls are provided for all 24 volt control functions. The resident control algorithms will make all heating, cooling and/or ventilating decisions in response to electronic signals from sensors measuring outdoor temperature and humidity. The control algorithm maintains accurate temperature control, minimizes drift from set point and provides better building comfort. A centralized PLC (UC600) will provide anti-short cycle timing for a higher level of machine protection. Terminals are provided for a field installed dry contact or switch closure to put the unit in the Occupied or Unoccupied modes.

2. Controller/control devices shall be capable of standalone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
3. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
4. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
5. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a BACnet network.
6. Unit shall be provided with a high condensate level (overflow) switch that shuts down the unit when a high water level is detected in the drain pan.

M. Powered Exhaust: Direct Drive w/VFD & Gravity Damper

1. Powered Exhaust Fan motor shall be direct drive type with factory installed Variable Frequency Drive to allow variable air volume operation. All motors shall be thermally protected. All fan motors shall meet the U.S. Energy Policy Act of 2005 (EPACT). All Fan(s) shall be mounted on rubber vibration isolators, to reduce the transmission of noise.
2. Fans and motors shall be dynamically balanced and mounted on rubber isolators.
3. Unit shall include barometric relief dampers.
4. Motors shall be premium efficiency TEFC with ball bearings rated for 200,000 hours service with external lubrication points.
5. Access to exhaust fans shall be through double wall, hinged access doors with quarter turn lockable handles.
6. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.
7. Exhaust dampers shall be sized for 100% relief.

N. Energy Recovery & Conservation: ERC-3018C-4M

1. Energy recovery wheel performance shall be AHRI 1060 certified and bear the AHRI certified label. The rotor media shall be light weight and must be made of aluminum. Paper or fibrous media are not acceptable. All surfaces must be coated with a nonmigrating adsorbent layer of desiccant prior to being formed into the media structure to insure that all surfaces are coated and that adequate latent capacity is provided. The desiccant must be a 3A molecular sieve designed for the adsorption of water vapor. The media shall be cleanable by vacuuming the media surface, without degrading the latent recovery. Dry particles up to 800 microns shall pass freely through the media.
2. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Energy Recovery Ventilation Equipment. Cassettes shall be listed in the AHRI Certified Products.

O. Outside Air

1. Unit shall include 0-100% modulating enthalpy based economizer, components and field provided controls in accordance with ICC IECC. The economizer shall consist of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled by spring return enthalpy activated fully modulating actuator. Unit shall include outside air opening bird screen, outside air hood, and relief/exhaust dampers.

P. Filters

1. Aluminum Mesh Filters (K and N Cabinets) and Galvanized Mesh Bird Screen (B and G Cabinets) shall be installed on the intake of the unit. In addition, one row of 2 inch MERV-8 rated prefilters (30 percent) and 2 inch MERV-13 final filter (80 percent) installed prior to the evaporator coil. Unit shall be equipped with a 6” filter rack upstream of the evaporator. Frame shall be field-adjustable to match any filter combination specified in the attached selection.
2. Unit shall include a clogged filter switch.

Q. Electrical - Non-Fused Disconnect Switch "Circuit Breaker" w/ 115v Outlet (B/G)

1. A 3-pole, molded case, HACR circuit breaker with provisions for through the base electrical connections shall be factory installed. Wiring will be provided from the circuit breaker to the unit high voltage terminal block. The switch will be UL/CSA agency recognized. The circuit breaker will be sized per NEC and UL guidelines. A powered 120 volt, 15 amp, 2 plug convenience outlet shall be factory installed. A service receptacle disconnect shall be installed. The convenience outlet is powered from the line side of the disconnect or circuit breaker, and therefore will not be affected by the position of the disconnect or circuit breaker.
2. Unit shall have a 5kAIC SCCR.
3. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.
4. Unit shall be provided with a factory installed and factory wired 115V, 12 amp GFI outlet disconnect switch in the unit control panel.
5. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.
6. Factory wired Voltage/Phase monitor shall be included as standard. In the event of any of the following, the units will be shut down and upon correction of the fault condition the unit will reset and restart automatically.
    1. Phase Unbalance Protection: Factory set 2%
    2. Over/Under/Brown Out Voltage Protection: +/-10% of nameplate voltage
    3. Phase Loss/Reversal

R. Accessories: Condenser Hail guard

1. Hail guards shall be installed on the outside of the condenser coil. The guards shall consist of perforated metal, of the same gauge and color as the unit itself. Airflow through the hail guards shall not be restricted due to location or size of the perforations. Guards shall be removable to accommodate coil cleaning.

2.4 FAN-MOTOR VARIABLE FREQUENCY DRIVES (VFDS)

A. Manufacturer shall provide UL or ETL listed VFDs and associated components, as scheduled and shown on drawings. VFDs shall comply with applicable provisions of the National Electric Code.

B. Contractor shall install and wire VFDs in accordance with manufacturer instructions, NEC, and local requirements.

C. After unit installation, VFD shall be started and programmed by a factory trained and employed service technician.

D. For complete requirements on VFDs, refer to Specification Section 230901 Variable Frequency Drives.

2.5 OUTSIDE AIR MEASURING AND MODULATION DEVICE

A. Maximum of 4 cfm/ft^2 leakage rate @ 1" H_2O when dampers are in the fully closed position.

B. Maximum torque to operate a single damper from fully closed to fully open and fully open to fully closed within a velocity range from 300 fpm to 2500 fpm

C. The outside air measuring damper made per this specification shall be used in conjunction with the electronic airflow velocity control module to obtain certified performance ratings for airflow measurement stations per AMCA Publication 611 and ANSI/AMCA Standard 610

D. Output: Linear 2-10 VDC representing zero to maximum cfm (Lis)

E. Accuracy: ± 5 percent of actual flow down to 15 percent nominal flow

F. Operating Temperature Range: -40 F (-40 C) to 158 F (70 C)

G. Operating Humidity Range: 0 to 100 percent RH over full temperature range Temperature Compensation: Automatically corrects for temperature effects on air density

2.6 CONTROLS

A. Controls: Refer to Section 230900.

2.7 MOTORS

A. Refer to Section 230513 for motor requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify roof curbs are installed and dimensions are as shown on shop drawings.

3.2 INSTALLATION

A. Install in accordance with ARI 430.

B. Roof Curb:

1. Assemble roof curb.
2. Install roof curb level.
3. Coordinate curb installation and flashing.
4. Install units on roof curb providing watertight enclosure to protect ductwork and utility services.
5. Install gasket material between unit base and roof curb.
6. Installation of the units and curbs shall comply with the specification Section 230548 – Vibration and Wind Controls for HVAC.

C. Install flexible connections between unit and inlet and supply and return ductwork. Install metal bands of connectors parallel with minimum 1-nch flex between ductwork and fan while running.

D. Install condensate piping with trap and route from drain pan to nearest roof drain.

E. Insulate coil headers located outside airflow as specified for piping. Refer to Section 230719.

3.3 CLEANING

A. Vacuum clean coils and inside of unit cabinet.

B. Install temporary filters during construction period. Replace with permanent filters at Substantial Completion.

3.4 PROTECTION OF FINISHED WORK

A. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

3.5 LEVELING

A. The Mechanical Contractor shall level all unit sections in accordance with the unit manufacturer’s instructions. The Mechanical Contractor shall provide and install all necessary permanent shim material to ensure individual sections and entire assembled units are level.

3.6 FINAL INSPECTION AND START UP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions.

C. After the Mechanical Contractor has provided all water piping connections, ductwork connections, and field control wiring, and Electrical Contractor has provided all the field power wiring, the Mechanical Contractor shall inspect the installation. The Mechanical Contractor shall then perform startup of the equipment.

D. The Building Automation System (BAS) Contractor shall be scheduled to be at the job site at the time of the equipment start up.

E. The Mechanical Contractor, shall perform the following tests and services and submit a report outlining the results:

1. Record date, time, and person(s) performing service.
2. Lubricate all moving parts.
3. Check all motor and starter power lugs and tighten as required.
4. Verify all electrical power connections.
5. Conduct a start up inspection per the AHU manufacturer's recommendations.
6. Record fan motor voltage and amperage readings.
7. Check fan rotation and spin wheel to verify that rotation is free and does not rub or bind.
8. Check fan for excessive vibration.
9. Remove all foreign loose material in ductwork leading to and from the fan and in the fan itself.
10. Disengage all shipping fasteners on vibration isolation equipment.
11. Check safety guards to insure they are properly secured.
12. Secure all access doors to the fan, the unit and the ductwork.
13. Switch electrical supply "on" and allow fan to reach full speed.
14. Physically check each fan at start up and shut down to insure no abnormal or problem conditions exist.
15. Check entering and leaving air temperatures (dry bulb and wet bulb) and outside air temperature.
16. Check all control sequences.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. A minimum of 4 hours shall be provided. Schedule training with Owner, provide at least 7 days notice to the Owner of training date.

3.8 EQUIPMENT SOUND POWER

A. The provided sound levels in the table below are estimated levels. Actual sound power levels of the units could be slightly different than shown in the specification.

	DOAS Unit Standard Radiated Sound Power Levels								
Octave Bands	63	125	250	500	1000	2000	4000	8000	Total
DOAS Unit (dB), Typical	50.4	75.1	84.6	87.3	86.5	83	76.5	68.5	91.9

END OF SECTION 237433

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 238124 - CONTROL-ROOM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The Contractor shall provide all labor, materials, equipment and incidentals to furnish and install all Control Room Air Conditioning Units with the requirements specified herein and as shown on the Contract Drawings or specified in the Detailed Specifications.

B. Each system shall be furnished complete with an indoor evaporator/air conditioning unit, an outdoor air cooled condenser unit, refrigerant piping, insulations, control wiring and all accessories, special tools, spare parts, base attachments, mountings, anchor bolts and other appurtenances as specified or as may be required for a satisfactory installation.

C. All control room air conditioning units shall be furnished in accordance with the schedule shown on the Contract Drawings.

1.2 RELATED SPECIFICATIONS

1. Specification 230548 – Vibration and Wind Controls for HVAC Piping and Equipment
2. Specification 230553 - Identification for HVAC Piping and Equipment
3. Specification 230593 - Testing, Adjusting, and Balancing for HVAC

1.3 PAYMENT

Payment for work furnished and installed under this Section shall be as specified in the Detailed Specification.

1.4 REFERENCES

A. Equipment shall comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. American Society of Mechanical Engineers (ASME)
2. American Society of Testing and Materials (ASTM)
3. Air Movement and Control Association (AMCA)
4. Air Conditioning and Refrigeration Institute (ACRI)
5. National Fire Protection Association (NFPA)
6. National Electrical Code (NEC)
7. Applicable Federal, State and local laws and/or ordinances

B. Where conflict arises between the local codes and the requirements of the National Electrical Code, The National Fire Code, NEMA, ASTM, etc., the more stringent requirements shall prevail.

1.5 SUBMITTALS

A. In accordance with the procedures and requirements set forth in the Detailed Specifications the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings
2. Preliminary Operation and Maintenance Manuals
3. Final Operation and Maintenance Manuals
4. Spare Parts List
5. Special Tools List
6. Reports of Certified Shop Tests
7. AMCA Approval of Fan Ratings

B. Each submittal shall be identified as specified in the Detailed Specifications.

C. Shop Drawings:

1. Each submittal shall be complete in all aspects incorporating all information and data listed herein and all additional information required to evaluate the proposed piping material's compliance with the Contract Documents. Partial or incomplete submissions shall be returned to the Contractor disapproved without review.
2. Partial, incomplete or illegible submissions will be returned to the Contractor without review for resubmittal.

3. Shop drawings shall include but not be limited to:

   a. Equipment specifications and data sheets identifying all materials used and methods of fabrication.
   b. Complete assembly, layout, installation drawings with clearly marked dimensions.
   c. Computer printout for coil selection.
   d. Interconnecting wiring diagram.
   e. Example equipment nameplate data sheet.
   f. Color charts for selection by the Engineer.

D. Operations and Maintenance Manuals

1. The Contractor shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in the of the Detailed Specifications.
2. Two copies of a preliminary O&M manual shall be included in the shop drawing submittal. Without inclusion of these manuals, the submittal will be considered incomplete and will be returned without review.

E. Lubricants

1. The manufacturer shall submit a list with a minimum of four manufacturers standard lubricants which may be used interchangeably for each type of lubricant required.
2. The Contractor shall utilize this list in preparing his comprehensive lubrication survey as specified in the Detailed Specifications.

1.6 QUALITY ASSURANCE AND QUALIFICATIONS

A. The equipment covered by these specifications is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and as shown on the Contract Drawings.

1.7 SPARE PARTS AND SUPPLIES

A. Furnish all special tools necessary to dissemble, service, repair and adjust the equipment.

B. The following spare parts shall be furnished with each unit:

1. Four (4) sets of 2" Pleated Filters
2. Two (2) sets of Match V Belts
3. Two (2) Canisters for Humidifier One (1) Temperature Sensor
4. One (1) Humidity Sensor
5. One (1) Set of Bearings and Seals
6. One (1) Set of Sheaves
7. One (1) Quart of Touch-Up Paint

C. Furnish additional spare parts as recommended by the equipment manufacturers.

D. Spare parts lists, included with the shop drawing submittal shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

E. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of control room air conditioning units that fail in materials or workmanship within specified warranty period.

1. The warranty shall include parts and labor costs.

2. Warranty Period:

a. For Compressor Parts: Five year(s) from date of Substantial Completion.
b. For Parts: One year(s) from date of Substantial Completion.
c. For Labor: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Liebert
2. APC
3. Data Air
4. Or approved equal

B. Basis of design: The control room air conditioning unit and air-cooled condenser as shown on the drawings.

2.2 CONTROL ROOM AIR CONDITIONING UNITS (FLOOR MOUNTED)

A. The Control Room Air Conditioning System shall factory assembled units with air delivery arrangement as shown on the schedules or specified in this section.

B. Up flow Supply

1. Up flow Supply with Front Air Return
2. The supply air shall exit from the top of the cabinet. The return air shall be through the front factory installed grilles. The EC fan shall be factory mounted in the upper portion of the unit. The fan shall be located to pull air through the filters and cooling coil to ensure even air distribution and maximum coil performance.

C. Cabinet Construction

1. The exterior panels shall be 20 gauge steel and powder-coated with RAL 7021 black color paint to protect against corrosion. The exterior panels shall be insulated with 1/2” to 1", 1-1/2 lb. insulation. Front and side panels shall have captive, quarter-turn fasteners. The cabinet shall be designed so that all components are serviceable and removable using the front and right sides of the unit.
2. The floor stand shall be constructed of galvanized steel. The floor stand shall have adjustable legs with vibration isolation pads. The floor stand shall be 12 IN. HIGH.

D. Filtration

1. The filter shall be an integral part of the system and located within the cabinet. The filter shall be deep- pleated, 2 in thick with a MERV 11 rating efficiency based on ASHRAE 52.2-2007. A filter clog switch shall be included. Mesh type, cleanable filters shall be unacceptable.

E. Electrical Reheat

1. The reheat shall be a low-watt density 304/304 stainless steel finned-tubular electric reheat. The reheat section shall include UL/CSA recognized safety switches to protect the system from overheating. The electric reheat shall be controlled in two stages.

F. Fan and Motor

1. The fan shall be equipped with one plug fan: integral direct driven fan with backward-curved blades and electronically commutated DC motor; commonly referred to as EC fan. The fan speed shall be variable and automatically regulated by through all modes of operation. The fan shall have a dedicated motor, fault monitoring circuitry, and speed controller, which shall provide a level of redundancy. The impeller shall be made of aluminum and dynamically balanced. The EC fan shall be located within the unit. The EC fan shall also provide greater energy savings than forward curved centrifugal fan and variable speed drives.
2. System shall be suitable for ducted supply air distribution.

G. Condensate Pump

1. The condensate pump shall be factory furnished and installed, dual- float condensate pump type with ½" check valve shall be completed with integral primary and secondary float switches, motor assembly and reservoir. The secondary float shall send a signal to the local alarm and shut down the unit upon high water condition.

H. Microprocessor Control

1. The control system shall be microprocessor-based, factory-wired into the system cabinet and tested prior to shipment. The display and housing shall be viewable while the front panel is open or closed. The controls shall be menu-driven. The system shall display user menus for active alarms, event log, graphic data, unit view/status overview (including the monitoring of room conditions, operational status in percentage of each function, date and time), total run hours, various sensors, display setup and service contacts. A password shall be required to make system changes. Service menus shall include setpoints, standby settings (lead/lag), timers/sleep mode, alarm setup, sensor calibration, maintenance/wellness settings, options setup, system/network setup, auxiliary boards and diagnostics/service mode. The control system control shall provide Ethernet/RS-485 ports dedicated for BMS connectivity (i.e., Base-Comms).

    a) Password Protection – The control shall contain two unique passwords to protect against unauthorized changes. An auto hide/show feature shall allow the user to see applicable information based on the login used.
    b) Unit Backup and Restore - The user shall be able to create safe copies of important control parameters. The control shall have the capacity for the user to automatically backup unit configuration settings to internal memory or USB storage drive. Configuration settings may be transferred to another unit for a more streamlined unit startup.
    c) Parameter Download - The control shall enable the user to download a parameter file that lists parameter names, factory default settings and user- programmed settings in .csv format for remote reference.
    d) Parameter Search - The control shall have search fields for efficient navigation and parameter lookup.
    e) Parameter Directory - The control shall provide a directory that lists all parameters in the control. The list shall provide Line ID numbers, parameter labels, and current parameter values.

f) Context-Sensitive Help - The control shall have an on-board help database. The database shall provide context-sensitive help to assist with setup and navigation of the menus.

g) Display Setup - The user shall be able to configure the display information based on the specific user's preference. Language, units of measure, screen contrast, home screen layout, back-light timer, and the hide/show of certain readouts shall be configurable through the display.

h) Additional Readouts - The display shall enable the user to configure custom widgets on the main screen. Widget options will include items such as fan speed, call for cooling, call for free- cooling, maintenance status, call for hot water reheat, call for electric reheat, call for dehumidification, call for humidification, airflow, static pressure, fluid flow rate and cooling capacity.

i) Status LEDs - The control shall show the unit's operating status using an integral LED. The LED shall indicate if the unit has an active alarm; if the unit has an active alarm that has been acknowledged; or if the unit is On, Off or in standby status.

j) Event Log - The control shall automatically store the last 400 unit-only events (messages, warnings, and alarms).

k) Service Contact Information - The control shall be able to store the local service or sales contact information.

l) Upgradeable - control upgrades shall be performed through a USB connection.

m) Timers/Sleep Mode - The menus shall allow various customer settings for turning the unit On or Off.

n) Menu Layout - The menus shall be divided into two main menus: User and Service. The User screen shall contain the menus to access parameters required for basic unit control and setup. The Service screen shall be de-signed for service personnel and shall provide access to advanced control setup features and diagnostic information.

o) Sensor Calibration - The menus shall allow unit sensors to be calibrated with external sensors.

p) Maintenance/Wellness Settings - The menus shall allow reporting of potential component problems before they occur.

q) Options Setup - The menus shall provide operation settings for the installed components.

r) Auxiliary Boards - The menus shall allow setup of optional expansion boards.

s) Various Sensors: The menus shall allow setup and display of optional custom sensors. The control shall include four customer accessible analog inputs for field-supplied sensors. The analog inputs shall accept a 4 to 20mA signal. The user shall be able to change the input to 0 to 5VDC or 0 to 10VDC. The gains for each analog input shall be programmable from the front display. The analog inputs shall be able to be monitored from the front display.

t) Diagnostics/Service Mode - The control shall be provided with self- diagnostics to aid in troubleshooting. The microcontroller board shall be diagnosed and reported as pass/not pass. Control inputs shall be indicated as On or Off at the front display. Control outputs shall be able to be turned On or Off from the front display without using jumpers or a service terminal. Each control output shall be indicated by an LED on a circuit board.

Base-Comms for BMS Connectivity – The control controller shall provide one Ethernet Port and RS-485 Port dedicated for BMS Connectivity. Provides ground fault isolated RS-485 Modbus, BACnet IP & Modbus IP network connectivity to Building Management Systems for unit monitoring and management. Also, provides ground fault isolated 10/100 baseT Ethernet connectivity for unit monitoring and management. The supported

management interfaces include: SNMP for Network Management Systems, HTTP for web page viewing, SMTP for email, and SMS for mobile messaging. The unit controller shall support dual IP on a single network and one 485 protocol simultaneously.

I. Electrical Switches

1. Disconnect Switch, Non-Locking: The non-automatic, non-locking, molded case circuit interrupter shall be factory mounted in the high-voltage section of the electrical panel. The switch handle shall be accessible from the unit front and mounted on the indoor air-cooled centrifugal condensing unit
2. Filter Clog Switch: The filter clog switch senses pressure drop across the filters and shall annunciate the wall controller upon exceeding the adjustable setpoint.

J. Plenum Construction

1. The exterior panels shall be 20 gauge steel and powder-coated with black color paint to protect against corrosion. The exterior panels are insulated with 1/2” to 1" (12.7 to 25.4mm), 1-1/2 lb. (0.68 kg) insulation. Front and side panels shall have captive, quarter-turn fasteners

K. Accessories

1. Provide unit with extra remote shutdown terminals (Low Voltage Terminal Pack)
2. Provide BAS Interface controls (BACnet)

L. Alarms

1. Unit Alarm
   The control system shall monitor unit operation and activate an audible and visual alarm in the event of the following factory preset alarm conditions:
   a. High Temperature
   b. Low Temperature
   c. High Humidity
   d. Low Humidity
   e. EC Fan Fault
   f. High Head Pressure
   g. Low Suction Pressure
   h. Filter Clog – change filters
   i. Loss of Air Flow
   j. Loss of Power
   k. Compressor Overload
   l. Humidifier Problem
2. Custom Alarms (3x)
   a. Smoke Detected
   b. Custom 1
   c. Custom 2
   d. Custom 3
   User-customized text can be entered for the three (3) custom alarms.

3. Alarm Controls: Each alarm (unit and custom) shall be individually enabled or disabled (except for high head pressure and high water in condensate pan) and can be programmed for a time delay of 0 to 255 seconds of continuous alarm condition to be recognized as an alarm. Each alarm can also be enabled or disabled to activate the common alarm (except high head pressure and high water in condensate pan).
4. Audible Alarm: The audible alarm shall annunciate at the LCD wall box any alarm that is enabled by the operator.
5. Common Alarm: A programmable common alarm shall be provided to interface user selected alarms with a remote alarm device. Alarms shall be enabled or disabled from reporting to the common alarm.
6. Remote Monitoring: All alarms shall be communicated to the remote monitoring system with the following information: date and time of occurrence, unit number and present temperature and humidity.

2.3 Direct Expansion System Evaporator Components

A. Direct Expansion Coil

1. Single refrigeration circuit shall include a liquid line filter drier, a refrigerant sight glass with moisture indicator, an expansion valve, pressure safety switches, and a liquid line solenoid valve. The indoor evaporator refrigerant piping shall be filled with a nitrogen holding charge and spun shut. Field relief of the Schrader valve shall indicate a leak-free system
2. Evaporator and condensing unit shall be field piped using copper lines, brazed, evacuated and field charged with R-410A refrigerant.
3. The coil assembly shall be mounted in a condensate drain pan, with an internally trapped drain line. The evaporator drain pan shall include a factory-installed float switch to shut down the evaporator upon high water condition.
4. The direct-expansion, tilted-slab cooling coil shall be constructed of copper tubes and hydrophilic-coated aluminum fins. The hydrophilic coating shall significantly improve the speed of condensate drainage from the fins and shall provide superior water carryover resistance. One stainless steel condensate drain pan shall be provided

2.4 Outdoor Air-Cooled Prop Fan Condensing Unit

A. The condensing unit shall be designed for outdoor use with either roof or ground level mounting. The condenser cabinet shall be constructed of bright aluminum sheet and divided into individual fan sections by full width baffles. Internal structural support members, including coil support frame, shall be galvanized steel for strength and corrosion resistance. Panel doors shall be provided on two sides of each coil/fan section to permit coil cleaning. An electrical panel shall be contained inside a factory-mounted NEMA 3R weatherproof electrical enclosure..

B. The air cooled condenser shall be a factory-assembled unit, complete with integral electrical panel, designed for outdoor installation. The condenser shall be a draw-through design.

C. Condenser shall consist of microchannel condenser coil, propeller fan direct-driven by individual fan motor, electrical controls, housing, and mounting legs. The air cooled condenser shall provide positive refrigerant head pressure control to the indoor cooling unit by adjusting heat rejection capacity. Microchannel coils shall provide superior heat transfer, reduce air-side

pressure drop, increase energy efficiency, and significantly reduce the system refrigerant volume required. EC fans and fan operating techniques shall reduce sound levels. Various methods shall be available to match indoor unit type, maximum outdoor design ambient and maximum sound requirements.

D. The microchannel coils shall be constructed of aluminum microchannel tubes, fins, and manifolds. Tubes shall be flat and contain multiple, parallel flow microchannels and span between aluminum headers. Full-depth louvered aluminum fins shall fill spaces between the tubes. Tubes, fins, and aluminum headers shall be oven-brazed to form a complete refrigerant-to-air heat exchanger coil. Copper stub pipes shall be electric resistance welded to aluminum coils and joints protected with polyolefin to seal joints from corrosive environmental elements. Coil assemblies shall be factory leak tested at a minimum of 300 psig. Hot gas and liquid lines shall be copper and shall be brazed using nitrogen gas flow to the stub pipes with spun-closed ends for customer piping connections. Complete coil/piping assembly shall be then filled and sealed with an inert gas holding charge for shipment.

E. Aluminum microchannel coil with E-coat shall provide a flexible epoxy coating to all coil surface areas without material bridging between fins. E-coat shall increase coil corrosion protection and shall reduce heat rejection capacity degradation to less than 10% after a severe 2000 hour 5% neutral salt spray test (ref. ASTM B117). The coating process shall ensure complete coil encapsulation, and the color shall be black. A UV topcoat shall be applied to prevent UV degradation of E-coat

F. The compressor shall be an R-410A scroll-type with variable capacity operation from 20-100%, commonly known as a digital scroll. The compressor solenoid valve shall unload the digital scroll compressor to provide variable capacity operation. The compressor shall have a suction gas cooled motor, EPDM Rubber vibration isolators, internal thermal overloads, automatic reset high pressure switch with lockout after three failure occurrences, rota-lock service valves, low pressure transducer, and crankcase heater. The compressor shall be removable and serviceable from the front of the unit. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during Off cycles.

G. The compressor sound jacket shall reduce the level of sound emitted from the digital scroll compressor. It shall consist of a 3/8-inch closed cell polymeric 4.5 - 8.5 lb/ft3 density jacket that encloses the compressor.

H. An electronically-controlled expansion valve (EEV) shall precisely control the flow of liquid refrigerant entering the direct-expansion coil. The EEV shall be of stepper-motor type. The EEV shall maintain consistent superheat of the refrigerant vapor at the outlet of the evaporator coil over the unit's operating range. The valve shall be controlled by a separate electronic controller. Superheat shall be determined through the suction-pressure-temperature method.

I. The fan motor/blade assembly shall have an external rotor motor, fan blades and fan/finger guard. Fan blades shall be constructed of cast aluminum or glass-reinforced polymeric material. Fan guards shall be heavy gauge, close-mesh steel wire, coated with a black corrosion resistant finish. Fan terminal blocks shall be in an IP54 enclosure on the top of the fan motor. Fan assemblies shall be factory-balanced, tested before shipment and mounted securely to the condenser structure.

J. The EC fan motors shall be electronically commutated for variable speed operation and shall have ball bearings. The EC fans shall provide internal overload protection through built-in electronics. Each EC fan motor shall have a built-in controller and communication module, linked via RS485

communication wire to each fan and the Premium Control Board, allowing each fan to receive and respond to precise fan speed inputs from the Premium Control Board

K. Electrical controls and service connection terminals shall be provided and factory-wired inside the attached control panel section. Only high-voltage supply wiring and low voltage indoor unit communication/interlock wiring are required at condenser installation.

L. The EC fan/Premium Control System shall include an electronic control board, EC fan motor(s) with internal overload protection, refrigerant and ambient temperature thermistors, and refrigerant pressure transducers. The Premium Control Board shall communicate directly with the indoor unit's control via field-supplied CANbus communication wires and via field-supplied low voltage interlock wires. The control board shall use sensor and communication inputs to maintain refrigerant pressure by controlling each EC fan on the same refrigerant circuit to the same speed. The Premium control board shall be rated to a temperature of -30°F to 125°F. The premium control shall be factory set for fan speed control.

M. Condensing unit shall be designed for 95°F ambient and be capable of operation to -30°F.

2.5 Factory-Installed Options

A. Steam Generating Humidifier

1. The Thermal Management system shall be equipped with a steam generating humidifier that is controlled by the microprocessor control system. It shall be complete with disposable canister, all supply and drain valves, 1" air gap on fill line, inlet strainer, steam distributor and electronic controls. The need to change canister shall be annunciated on the microprocessor wall box control panel. The humidifier shall have a capacity of 4.5 lb/hr. An LED light on the humidifier assembly shall indicate cylinder full, overcurrent detection, fill system fault and end of cylinder life conditions. The canister flush water shall not drain into the coil drain pan, due to risk of aggressive corrosion of the evaporator coil. The humidifier wand shall be mounted over the coil drain pan.

B. Smoke Sensor

1. The smoke sensor shall immediately shut down the Thermal Management system and activate the alarm system when activated. The sensing element shall be located in the return air compartment. This smoke sensor shall not function or replace any room smoke detection system that may be required by local or national codes.

C. Temperature and Humidity Sensor

1. Return air temperature and humidity sensor shall be mounted inside the unit

D. High Temperature Sensor

1. Sensor shall be factory installed in the unit and shall be factory-set to 125ºF. It shall immediately shut down the environmental control system when activated. The sensor shall be mounted with the sensing element in the return air. This sensor is not meant to replace any fire detection system that may be required by local or national codes.

E. Compressor Overload

1. A factory-installed sensor designed to detect high compressor currents and provide input to shut down the compressor as a compressor protection feature.

2.6 Ship-Loose Accessories

A. Two (2) filters shall be included 2" deep-pleated type, with a MERV 11 rating efficiency based on ASHRAE 52.2-2007. A filter clog switch shall be included. Mesh type, cleanable filters shall be unacceptable.

B. Remote Monitoring and Control – IS-Unity-DP and BMS – Field-installed Unit-mount Kit

The BMS Monitoring Solution shall provide SNMP v1/v2c/v3, BACnet IP, BACnet MSTP, Modbus TCP/IP, and Modbus RTU monitoring capability to the factory provided system. Card shall employ Ethernet and RS-485 networks to monitor and manage a wide range of operating parameters pertaining to the cooling system. The Unity card shall provide access to the unit controller remotely via a web interface and shall support the unit connectivity. The unit-mount external enclosure kit for field-installation shall include the DDC communication card, power/communication interface card, galvanized steel enclosure, power and communication wire harnesses and full instructions. Field-supplied wiring for communication from the unit to other systems shall be required to access features.

C. Site Monitoring System

A factory provided Site Monitoring System (SMS) shall be for remote monitoring of the unit and monitoring of other equipment of the same manufacturer. The SMS shall have the capability to monitor and change (at the user direction) the temperature and humidity setpoints and sensitivities of each unit. The printer shall provide the user with chronological alarm information. It shall also be capable of being programmed to print out environmental conditions or operating modes at each unit. Provide indicated quantities of the following: Leak Detection System(s) Model, Remote Monitor(s), Auto Changeover Control(s)

PART 3 - EXECUTION

3.1 Installation

A. Control Room air conditioning unit shall be installed, connected and placed in satisfactory working order in accordance with the manufacturer's instructions and details, and the Contract Drawings. The Contractor shall furnish and install interconnecting wiring and conduits between the field mounted devices and the unit.

B. Identification

1. Each unit of equipment shall be identified with the equipment item numbers given on the Contract Drawings. A corrosion resistant tag and nameplate, securely affixed in a conspicuous place on each unit shall give the equipment item number, manufacturer's name

or trademark and such other information as the manufacturer may consider necessary, or as specified, to complete identification.

C. Testing

1. All tests shall be performed in accordance with the requirements of the Division 23 Specifications.
2. Motor tests in accordance with Specification 230513 – Common Motor Requirements for HVAC Equipment.
3. Field tests shall be performed in accordance with Specification 230593 - Testing, Adjusting, and Balancing for HVAC and Division 01 of the Detailed Specifications.

D. Manufacturer’s Rrepresentative

1. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall adequately supervise the installation and testing of all equipment furnished under this Contract. The services of the manufacturer's representative shall be provided for a period of 2 days.
2. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out the office of the owner representative on each day he is at the project.

E. Training:

1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. A minimum of 1 day shall be provided.

2. The Contractor shall include in his request for manufacturer approval a certification that the manufacturer has been advised of the stringent requirements for Training, and that the costs associated with said training submittals and training have been included in the manufacturer’s pricing.

END OF SECTION 238124

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 238128 – SPLIT-SYSTEM HEAT PUMP UNIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes split-system heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 1 of Specification Sections.

1.8 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. The warranty shall include parts and labor costs.

2. Warranty Period:

a. For Compressor: Five year(s) from date of Substantial Completion.
b. For Parts: Five year(s) from date of Substantial Completion.
c. For Labor: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following, or approved equal:

1. Trane/Mitsubishi Electric & Electronics USA, Inc.
2. Daikin
3. Lennox
4. Or approved equal

2.2 INDOOR UNIT

A. Ducted Evaporator-Fan Components:

1. General:
   a. The unit shall have the ability to be recessed into the ceiling for air distribution
   b. The unit shall be factory assembled, piped, wired, as well as run tested at the factory.
   c. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
   d. The unit shall be equipped with an electronic expansion valve.
   e. The unit shall have medium static pressure capability.
   f. The unit shall come equipped with wired zone controller.

2. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110. The coil fins shall be coated with corrosion resistant material.
4. Fan: Brushless; directly connected to motor.
5. Fan Motors:

   a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
   c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Filters: anti-mold polypropylene, washable type.
8. Built-in condensate pump with 33.5” lift.
9. Condensate Drain Pans:

   a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

   b. Single-wall, galvanized-steel sheet.
   c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

      1) Minimum Connection Size: NPS 1.

   d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
   e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.
10. 208, 1 phase, 60 Hertz separate from the outdoor unit

B. Wall Mounted Evaporator-Fan Components:

1. General:
   a. The indoor unit shall communicate with the outdoor unit via 24VDC control wiring.
   b. The unit shall have the ability to be attached to bracket that secures unit to the wall.

c. The unit shall be factory assembled, piped, wired, as well as run tested at the factory.
d. The unit and refrigerant pipes will be charged with dehydrated air (nitrogen gas) prior to shipment from the factory.
e. The unit shall come equipped with wireless remote controller.
f. The indoor unit shall have a self-diagnostics function
g. The unit shall be designed for use with R410a refrigerant.

2. Cabinet:
   a. All casings, regardless of model size, shall have the same Munsell 1.0Y 9.2/0.4 white finish
   b. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining are required.
   c. There shall be a separate back plate which secures the unit firmly to the wall.

3. Refrigerant Coil:
   a. The indoor unit coil shall be of nonferrous construction with smooth plate fins on copper tubing.
   b. The tubing shall have inner groves for high efficiency heat exchange.
   c. All tube joints shall be brazed with silver alloy.
   d. The coils shall be pressure tested at the factory.
   e. A sloped, corrosion resistant condensate pan with drain shall be provided under the coil.
   f. A drain pan level switch (SS610E), designed to connect to the control board, shall be provided, if required, and installed in the condensate pan to prevent condensate from overflowing.

4. Fan Motors:
   a. Brushless DC fan motor drive.
   b. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   c. The indoor fan shall be statically and dynamically balanced to run on a single motor with permanently lubricated bearings.
   d. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
   e. An integral, motorized, multi-position, horizontal air sweep vane shall provide for uniform air distribution, up and down. Vane shall have 5 selectable positions plus AUTO (Controls position based upon mode, microprocessor shall automatically determine the vane angle to provide the optimum room temperature distribution) and SWING (Continuously moves up and down). In OFF mode the horizontal vane shall return to the closed position.
      The indoor unit shall include an AUTO fan setting capable of maximizing energy efficiency by adjusting the fan speed based on the difference between controller set-point and space temperature. The indoor fan shall be capable of five (5) speed settings, Low, Mid1, Mid2, High and Auto.

5. Filter: Return air shall be filtered by means of an easily removable, washable filter.

6. Built in condensate pump

Internal mount in the unit condensate pump with reservoir, check valve, water level sensor and leak detector (by unit manufacturer).

7. Controls:
   a. The unit shall include an IR receiver for wireless remote-control flexibility
   b. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
   c. Control board shall include contacts for control of external heat source. External heat may be energized as second stage when the space temperature is 1.8°F from set point.

8. Electrical:
   a. The unit electrical power shall be 208-230 volts, 1-phase, 60 hertz.
   b. The system shall be equipped with A-Control – a system directing that the indoor unit be powered directly from the outdoor unit using a 3-wire, 14 gauge AWG connections plus ground.
   c. The indoor unit shall not have any supplemental electrical heat elements.

9. Controls: Deluxe Wired MA Remore Controller

2.3 OUTDOOR UNIT

A. Air-Cooled, Compressor-Condenser Components:

1. General:
   a. The outdoor units are specifically designed to work with the wall mounted, ducted, 4-way cassette, ceiling suspended and multi-position air handler indoor units. The connected indoor unit shall be of the same capacity as the outdoor unit. The outdoor units must have a thermally fused powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.
   b. If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor. Contractor responsible for ensuring alternative brand compatibility in terms of availability, physical dimensions, weight, electrical requirements, etc.
   c. Outdoor unit shall have a sound rating no higher than 53 dB(A). If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
   d. Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.
   e. The outdoor unit shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.
   f. The outdoor unit shall be capable of guaranteed operation in heating mode down to -13F ambient temperatures and cooling mode up to 115F without additional restrictions on line length & vertical separation beyond those published in respective product catalogs. Models with capacity data for required temperature range published as "for reference only" are not considered capable of guaranteed operation

and are not acceptable. If an alternate manufacturer is selected, any additional material, cost, and labor to meet ambient operating range and performance shall be incurred by the contractor.

g. The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized wind baffle. The wind baffle shall allow for continuous cooling to 0FDB without any additional modifications to the unit

2. Casing:
   a. The casing shall be fabricated of galvanized steel, bonderized, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection. Assembly hardware shall be cadmium plated for weather resistance.
   b. Cabinet color shall be Munsell 3Y 7.8/1.1.
   c. Easy access shall be afforded to all serviceable parts by means of removable panel sections.
   d. Two (2) mild steel mounting feet, traverse mounted across the cabinet base pan, welded mount, providing four (4) slotted mounting holes shall be furnished. Assembly shall withstand lateral wind gust up to 155 MPH to meet applicable weather codes. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.
   e. Outdoor unit components shall be coated with the Seacoast Protection Coating to protect components from premature corrosion due to a seacoast environment. Coating shall be applied to components before original outdoor unit assembly to ensure manufacturer quality standards are not compromised and shall meet the following minimum requirements:
   f. Acrylic-Polyester Resin coating on External Panels
   g. Acrylic Resin coating on External Panel Base, Support Plate and Compressor Cover
   h. Anti-Corrosion, Hydrophilic coating on heat exchanger fins
   i. Anti-Humidification paint coating on printed circuit boards
   j. The outdoor unit shall be tested in compliance with JRA9002 such that no unusual rust shall develop after 960 hours of salt spray testing.
   k. Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs the salt spray protection is compromised, and the panel should be replaced immediately.

3. Compressor:
   a. The compressor shall be a high performance, hermetic, inverter driven, variable speed, dual rotary type manufactured by Mitsubishi Electric Corporation.
   b. The compressor motor shall be direct current (DC) type equipped with a factory supplied and installed inverter drive package.
   c. The compressor will be equipped with internal thermal overload protection.
   d. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.
   e. Filters, sight glasses, and traps shall not be used, and no additional refrigerant oil shall be required.
   f. The compressor shall be mounted so as to avoid the transmission of vibration.
   g. The outdoor unit shall have an accumulator and high pressure safety switch

4. Fan:

a. 1, 1.5, 2 and 2.5 ton units shall be furnished with a single direct drive propeller type fan. 3, 3.5 ton units shall be furnished with a two (2) direct drive propeller type fans.
b. The outdoor unit fan motor(s) shall be a direct current (DC) motor and have permanently lubricated bearings.
c. The fan motor shall be mounted for quiet operation.
d. The fan shall be provided with a raised guard to prevent contact with moving parts.
e. The outdoor unit shall have horizontal discharge airflow.

5. Refrigerant and piping:
   a. R410A refrigerant shall be required for systems.
   b. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
   c. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the equipment manufacturer and installed in accordance with manufacturer recommendations.
   d. All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.
   e. Refrigerant line sizing shall be in accordance with manufacturer specifications

6. Coil:
   a. The outdoor unit coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing
   b. The coil shall be protected with an integral metal guard.
   c. Refrigerant flow from the outdoor unit shall be regulated by means of an electronically controlled, precision, linear expansion valve.
   d. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102.
   e. All refrigerant connections between outdoor and indoor units shall be flare type.

7. Electrical:
   a. The outdoor unit electrical power supply shall be 208/230 volts, 1-phase, 60 hertz.
   b. The unit shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts.
   c. The outdoor unit shall be controlled by microprocessors located in the indoor unit and outdoor unit. A 12 to 24 volt DC data stream shall communicate between the units providing all necessary information for full function control.
   d. The outdoor unit shall be equipped with Pulse Amplitude Modulation (PAM) compressor inverter drive control for maximum efficiency with minimum power consumption.

8. Fan motor: permanently lubricated, with integral thermal-overload protection.
9. Low Ambient Kit: Permits operation down to 0 deg F.
10. Mounting Base: Polyethylene.
11. Wind load certified up to 120 mph up to 50ft
12. Protected with a pre-coated metal guard.

2.4 ACCESSORIES

A. Thermostat: Programmable, low voltage with subbase to control compressor and evaporator fan or wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
   a. Controllers provide on/off set point adjustment, fan speed adjustment.
   b. Fault diagnostic.
   c. Controllers provide on/off set point adjustment, fan speed adjustment.
   d. Indoor Circuit Board: able to process and receive indoor unit sensor values such as coil sensor temperatures, air return, and set point settings commands from the remote controller

B. BACnet interface connector, model PAC-UKPRC001-CN-1

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

D. Drain Hose: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units' level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Division 1 Specification Sections.
2. Install ground-mounted, compressor-condenser components on polyethylene mounting base.
3. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Wind Controls for HVAC."

D. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Duct connections: Duct installation requirements are specified in Section 233113 "Metal Ducts and Accessories." Drawings indicate the general arrangement of ducts. Connect outdoor duct to split-system air-conditioning units with flexible duct connector.

3.3 MANUFACTURER'S REPRESENTATIVE

A. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall adequately supervise the installation and testing of all equipment furnished under this Contract. The services of the manufacturer's representative shall be provided for a period indicated and as specified in the Specifications.

B. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out the office of the Resident representative on each day he is at the project.

C. Training:

1. The Contractor shall provide training for Maintenance personnel in accordance with Division 1 - General Requirements.
2. The Contractor shall include in his request for manufacturer approval a certification that the manufacturer has been advised of the stringent requirements for Training, and that the costs associated with said training submittals and training have been included in the manufacturer’s pricing. A minimum of 1 day of Training shall be provided.

END OF SECTION 238128

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 238129 - VARIABLE-REFRIGERANT-FLOW, HEAT PUMP RECOVERY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes complete variable refrigerant flow (VRF) heat pump recovery HVAC system(s) including, but not limited to the following components to make a complete operating system(s) according to requirements indicated:

1. Indoor, concealed, ceiling-mounted units for ducting.
2. Indoor, 4-Way ceiling-recessed cassette with grille 33”x33” for ceiling gride units.
2. Indoor,4-Way ceiling-recessed, cassette with griller 24”x24” for ceiling gride units
3. Outdoor, high efficiency air-source heat recovery units.
4. Heat recovery control units (HRCUs) or Branch circuit (BC) controllers as required for simultaneous heat/cool systems (or comparable branch devices)
5. System refrigerant and oil.
6. System condensate drain piping.
7. System refrigerant piping.
8. Metal hangers and supports.
9. Piping and tubing insulation.

1.3 DEFINITIONS

A. Air-Conditioning System Operation: System capable of operation with all zones in cooling only.

B. Heat-Pump System Operation: System capable of operation with all zones in either heating or cooling, but not with simultaneous heating and cooling zones that transfer heat between zones.

C. Heat Recovery System Operation: System capable of operation with simultaneous heating and cooling zones that transfer heat between zones.

D. HRCU: Heat Recovery Control Unit. HRCUs are used in heat recovery VRF HVAC systems to manage and control refrigerant between indoor units to provide simultaneous heating and cooling zones. "Heat Recovery Control Unit" is the term used by ASHRAE for what different manufacturers term as branch circuit controller, branch selector box, changeover box, flow selector unit, mode change unit, and other such terms.

E. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

F. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

G. Three-Pipe System Design: One high pressure refrigerant vapor line, one low pressure refrigerant vapor line, and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One liquid line and refrigerant vapor line connect HRCUs to associated indoor units.

H. Two-Pipe System Design: One refrigerant vapor line and one refrigerant liquid line connect a single outdoor unit or multiple manifold outdoor units in a single system to associated system HRCUs. One refrigerant liquid line and refrigerant vapor line connect HRCUs to associated indoor units. HRCUs used in two pipe systems act as an intermediate heat exchanger and include diverting valves and gas/liquid separators to move high and low pressure refrigerant between indoor units.

I. VRF: Variable refrigerant flow.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for indoor and outdoor units and for HRCUs.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. Include operating performance at design conditions and at extreme maximum and minimum outdoor ambient conditions.
4. Include description of system controllers, dimensions, features, control interfaces and connections, power requirements, and connections.
5. Include system operating sequence of operation in narrative form for each unique indoor- and outdoor-unit and HRCU control.
6. Include description of control software features.
7. Include total refrigerant required and a comprehensive breakdown of refrigerant required by each system installed.
8. Include refrigerant type and data sheets showing compliance with requirements indicated.
9. For system design software.
10. Indicate location and type of service access.

B. Shop Drawings: For VRF HVAC systems.

1. Include plans, elevations, sections, and mounting or attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Include diagrams and details of refrigerant piping and tubing showing installation requirements for manufacturer-furnished divided flow fittings.
5. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittals:

1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.
2. Include design calculations with corresponding diagram of refrigerant piping and tubing sizing for each system installed.
3. Include design calculations with corresponding floor plans indicating that refrigerant concentration limits are within allowable limits of ASHRAE 15 and governing codes.
4. Include calculations showing that system travel distance for refrigerant piping and controls cabling are within horizontal and vertical travel distances set by manufacturer. Provide a comparison table for each system installed.
5. See Specification 230548 Vibration and Wind Controls for the complete delegated-design requirements and submittals.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, elevations, sections, and details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural floors, roofs and associated members to which equipment, piping, ductwork, cables, and conduit will be attached.
3. Size and location of initial access modules for acoustical tile.
4. Wall-mounted controllers located in finished space showing relationship to light switches, fire-alarm devices, and other installed devices.
5. Size and location of access doors and panels installed behind walls and inaccessible ceilings for products installed behind walls and requiring access.
6. Items penetrating finished ceiling including the following:

    a. Luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Service access panels.

B. Qualification Data:

1. For Installer: Certificate from VRF HVAC system manufacturer certifying that Installer has successfully completed prerequisite training administered by manufacturer for proper installation of systems, including but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.

    a. Retain copies of Installer certificates on-site and make available on request.

2. For VRF HVAC system manufacturer.
3. For VRF HVAC system provider.

C. Product Certificates: For each type of product.

1. VRF indoor and outdoor units.

D. Product Test Reports: Where tests are required, for each product, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

E. Source quality-control reports.

F. Field quality-control reports.

G. Sample Warranties: For manufacturer's warranties.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VRF HVAC systems to include in emergency, operation, and maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On CD or DVD, USB media, or approved cloud storage platform, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters:

    a. One set(s) for each unit with replaceable filters.
    b. One set(s) for each unit type and unique size of washable filters.

2. Indoor Units: One for each unique size and type installed.
3. Controllers for Indoor Units: One for each unique controller type installed.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Nationally recognized manufacturer of VRF HVAC systems and products.
2. Shipped VRF HVAC systems with similar requirements to those indicated for a continuous period of five years within time of bid.
3. VRF HVAC systems and products that have been successfully tested and in use on at least five completed projects.
4. Having complete published catalog literature, installation, and operation and maintenance manuals for all products intended for use.
5. Having full-time in-house employees for the following:

    a. Product research and development.
    b. Product and application engineering.
    c. Product manufacturing, testing, and quality control.
    d. Technical support for system installation training, startup, commissioning, and troubleshooting of installations.
    e. Owner training.

B. Factory-Authorized Service Representative Qualifications:

1. Authorized representative of, and trained by, VRF HVAC system manufacturer.
2. In-place facility located within 50 miles of Project.
3. Demonstrated past experience with products being installed for period within five consecutive years before time of bid.
4. Demonstrated past experience on five projects of similar complexity, scope, and value.

    a. Each person assigned to Project shall have demonstrated past experience.

5. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.
6. Service and maintenance staff assigned to support Project during warranty period.
7. Product parts inventory to support ongoing system operation for a period of not less than five years after Substantial Completion.
8. VRF HVAC system manufacturer's backing to take over execution of Work if necessary to comply with requirements indicated. Include Project-specific written letter, signed by manufacturer's corporate officer, if requested.

C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by VRF HVAC system manufacturer.

1. Each employee shall be certified by manufacturer for proper installation of systems, including, but not limited to, equipment, piping, controls, and accessories indicated and furnished for installation.
2. Installer certification shall be valid and current for duration of Project.
3. Retain copies of Installer certificates on-site and make available on request.
4. Each person assigned to Project shall have demonstrated past experience.

a. Demonstrated past experience with products being installed for period within five consecutive years before time of bid.
b. Demonstrated past experience on five projects of similar complexity, scope, and value.

D. ISO Compliance: System equipment and components furnished by VRF HVAC system manufacturer shall be manufactured in an ISO 9001 and ISO 14001 facility.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean and dry place.

B. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

C. Handle products carefully to prevent damage, breaking, denting, and scoring. Do not install damaged products.

D. Protect products from weather, dirt, dust, water, construction debris, and physical damage.

1. Retain factory-applied coverings on equipment to protect finishes during construction and remove just prior to operating unit.
2. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remover coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.

E. Replace installed products damaged during construction.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace equipment and components that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period:

a. For Compressor: Seven year(s) from date of Substantial Completion.
b. For Parts, Including Controls: Five year(s) from date of Substantial Completion.
c. For Labor: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Trane/Mitsubishi Electric (Basis of Design)
2. Daikin
3. Lennox
4. Or approved other.

B. Source Limitations: Obtain products from single source from single manufacturer including, but not limited to, the following:

1. Indoor and outdoor units, including accessories.
2. Controls and software.
3. HRCUs, (BC) branch controller.
4. Refrigerant isolation valves.
5. Specialty refrigerant pipe fittings.

2.2 SYSTEM DESCRIPTION

A. Direct-expansion (DX) VRF HVAC system(s) with variable capacity in response to varying cooling and heating loads. System shall consist of multiple indoor units, HRCUs, outdoor unit(s), piping, controls, and electrical power to make complete operating system(s) complying with requirements indicated.

1. Two-pipe or three-pipe system design.
2. System(s) operation, heat pump or heat recovery as indicated on Drawings.
3. Each system with one refrigerant circuit shared by all indoor units connected to system.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. AHRI Compliance: System and equipment performance certified according to AHRI 1230 and products listed in AHRI directory.

D. ASHRAE Compliance:

1. ASHRAE 15: For safety code for mechanical refrigeration.
2. ASHRAE 62.1: For indoor air quality.
3. ASHRAE 135: For control network protocol with remote communication.
4. ASHRAE/IES 90.1 Compliance: For system and component energy efficiency.

E. UL Compliance: Comply with UL 1995.

2.3 PERFORMANCE REQUIREMENTS

A. Service Access:

1. Provide and document service access requirements.
2. Locate equipment, system isolation valves, and other system components that require service and inspection in easily accessible locations. Avoid locations that are difficult to access if possible.
3. Where serviceable components are installed behind walls and above inaccessible ceilings, provide finished assembly with access doors or panels to gain access. Properly size the openings to allow for service, removal, and replacement.
4. If less than full and unrestricted access is provided, locate components within an 18-inch reach of the finished assembly.
5. Where ladder access is required to service elevated components, provide an installation that provides for sufficient access within ladder manufacturer's written instructions for use.
6. Comply with OSHA regulations.

B. System Design and Installation Requirements:

1. Design and install systems indicated according to manufacturer's recommendations and written instructions.
2. Where manufacturer's requirements differ from requirements indicated, contact Architect for direction. The most stringent requirements should apply unless otherwise directed in writing by Architect.

C. System Adaptability to Future Changes: Arrange and size system refrigerant piping to accommodate future changes to system without having to resize and replace existing refrigerant piping.

1. Future changes to system(s) indicated on Drawings.
2. Each branch circuit shall accommodate addition of one indoor unit(s) with unit capacity equal to average indoor unit connected to the branch circuit.
3. Each branch circuit shall accommodate deletion of one indoor unit(s) with unit capacity equal to average indoor unit connected to the branch circuit.

D. Isolation of Equipment: Provide isolation valves to isolate each HRCU, indoor unit and outdoor unit for service, removal, and replacement without interrupting system operation.

E. System Capacity Ratio: The sum of connected capacity of all indoor units shall be within the following range of outdoor-unit rated capacity:

1. Not less than 60 percent.
2. Not more than 130 percent.
3. Range acceptable to manufacturer.

F. System Turndown: Stable operation down to 20 percent of outdoor-unit capacity.

G. System Auto Refrigerant Charge: Each system shall have an automatic refrigerant charge function to ensure the proper amount of refrigerant is installed in system.

H. Outdoor Conditions:

1. Suitable for outdoor ambient conditions encountered.

    a. Design equipment and supports to withstand wind loads of governing code and ASCE/SEI 7.
    b. Design equipment and supports to withstand snow and ice loads of governing code and ASCE/SEI 7.
    c. Provide corrosion-resistant coating for components and supports where located in coastal or industrial climates that are known to be harmful to materials and finishes.

2. Maximum System Operating Outdoor Temperature: See Drawings.
3. Minimum System Operating Outdoor Temperature: See Drawings.

I. Sound Performance: Sound levels generated by operating HVAC equipment shall be within requirements indicated.

1. Indoor: Within design guidelines of "2015 ASHRAE HANDBOOK- HVAC Applications."
2. Outdoor: Within ordinance of governing authorities.

J. Thermal Movements: Allow for controlled thermal movements from ambient, surface, and system temperature changes.

K. Capacities and Characteristics: As indicated on Drawings.

2.4 GENERAL VRF SYSTEM CONFIGURATION

1. 2-pipe design (typical both indoor IDU and outdoor units ODU)
2. Tracer SC+ Integration (Branch Controller)
3. Evaporation (Leaving Air) Temperature Control - Adjustable target VRF evap temperatures to optimize coverage of latent and sensible heat with DOAS system (typical for IDU)
4. All Aluminum Coil (TURYE) High Efficiency (typical for ODU units)
5. Hyper Heat Performance (TURYH) 100% heating capacity down to -13F (typical for ODU units)
6. Built in Refrigerant Filter w/ Isolation (typical for ODU units)
7. Serviceable BC Controller from bottom (typical for BC branch controllers units)
8. Continuous Hot Gas - Bottom section of coil will have hot gas at all times and protects the coil (typical for ODU units)
9. Auto Restart (typical both indoor IDU and outdoor units ODU)
10. Refrigerant Line Insulation per specifications
11. Connected Service Offering - Ability to identify and diagnose system issues without site access including annual on-site maintenance (typical for indoor IDU, outdoor units ODU and BC controller)

12. Aftermarket Regional Support – Ductless Technical Specialist Support, ~200 stores nationally to provide aftermarket parts support , certified technicians, training program, and product history (typical for indoor IDU or outdoor units ODU)
13. Any alterations to MCA / MOP will be responsibility of Contractor to address (typical both indoor IDU and outdoor units ODU)
14. Installation: Outdoor ASHP

2.5 INDOOR, CONCEALED, CEILING-MOUNTED UNITS FOR DUCTING

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Galvanized steel.
2. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3. Duct Connections: Extended collar or flange, or designated exterior cabinet surface, designed for attaching field-installed ductwork.
4. Mounting: Manufacturer-designed provisions for field installation.
5. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Unit Internal Tubing: Copper tubing with brazed joints.
6. Unit Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: The unit shall be provided with integral condensate lift mechanism capable of lifting drain water to not less than 27” inches from the condensate pan.
3. Field Piping Connection: Non-ferrous material with threaded NPT.

E. Fan and Motor Assembly:

1. Fan(s):

a. Direct-drive arrangement.
b. Single or multiple fans connected to a common motor shaft and driven by a single motor.
c. Fabricated from non-ferrous components or ferrous components with corrosion-resistant finish.
d. Wheels statically and dynamically balanced.

2. Motor: Brushless dc or electronically commutated with permanently lubricated bearings.
3. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
4. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
5. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Return filter box (rear or bottom placement) with high-efficiency filter as noted below. The return filter box shall be provided by the unit manufacturer/
2. Access: Bottom, side, or rear to accommodate field installation without removing ductwork and to accommodate filter replacement without need for tools.
3. Return air shall be filtered by means of a standard factory installed return air filter.
4. Efficiency: ASHRAE 52.2, MERV 13.
5. Return filter box (rear or bottom placement) with high-efficiency filter as noted above.
6. "Media" Subparagraph below describes two filter types: "replaceable" and "washable." Replaceable filters allow for higher filter efficiency. Washable filters have lower filter efficiency. Requirements may not be available on some products from some manufacturers. Consult manufacturers for availability.
7. Media: If more than one filter type is indicated, Contractor needs to coordinate with the owner which option to choose.

a. Replaceable: Extended surface, panel, or cartridge with antimicrobial treatment fiber media.
b. Washable: Manufacturer's standard filter with antimicrobial treatment.

G. Unit Accessories:
1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.

H. Unit Controls:

1. Enclosure: Metal, suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

a. Unit inlet air temperature.
b. Coil entering refrigerant temperature.
c. Coil leaving refrigerant temperature.

4. Field-Customizable I/O Capability:

a. Analog Inputs: Two or Three for use in customizable control strategies.

b. Digital Inputs: Two or Three for use in customizable control strategies.
c. Digital Outputs: Two or Three for use in customizable control strategies.

5. Features and Functions:

a. Self-diagnostics.
b. Time delay.
c. Auto-restart.
d. External static pressure control.
e. Auto operation mode.
f. Manual operation mode.
g. Filter service notification.
h. Power consumption display.
i. Drain assembly high water level safety shutdown and notification.
j. Run test switch.

6. Communication: Network communication with other indoor and outdoor units.
7. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
8. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

I. Unit Electrical:

1. Enclosure: Metal, suitable for indoor locations.
2. Field Connection: Single point connection to power unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in [metal]raceways.

2.6 INDOOR, 4-WAY CEILING-RECESSED CASSETTE WITH GRILLE FOR 33”x33” CEILING GRID UNITS

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3. Mounting: Manufacturer-designed provisions for field installation.
4. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.
5. The cabinet panel shall have provisions for a field installed filtered outside air intake.

6. Branch ducting shall be allowed from cabinet.
7. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
8. The grille vane angles shall be individually adjustable from a wired remote controller to customize the airflow pattern for the conditioned space.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: The unit shall be provided with integral condensate lift mechanism capable of lifting drain water to not less than 33” inches from the condensate pan.
3. Field Piping Connection: Non-ferrous material with threaded NPT.

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    c. Wheels statically and dynamically balanced.

2. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
3. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than three speed settings or variable speed with a speed range of least 50 percent.
4. Vibration Control: Integral isolation to dampen vibration transmission.
5. The indoor unit shall include an AUTO fan setting capable of maximizing energy efficiency by adjusting the fan speed based on the difference between controller set-point and space temperature. The indoor fan shall be capable of five (5) speed settings, Low, Mid1, Mid2, High and Auto.
6. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
7. The indoor unit fan logic must include multiple setting that can be changed to provide optimum airflow based on ceiling height and number of outlets used.
8. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.

9. The vanes shall have an Auto-Wave selectable option in the heating mode that shall randomly cycle the vanes up and down to evenly heat the space.
10. Grille shall include a factory-installed “3D i-see” sensor, or equal, to work in conjunction with indoor unit control sequence to prevent unnecessary cooling or heating in unoccupied areas of the zone without decreasing comfort levels. Sensor must detect occupancy (not simply motion) and location of occupants by measuring size & temperature of objects within a 39’ detecting diameter (based on 8.8ft mounting height) with 1,856 or more measuring points.

F. Filter Assembly:

1. Access: Bottom, to accommodate filter replacement without the need for tools.
2. Efficiency: ASHRAE 52.2, MERV 7
3. Media: If more than one filter type is indicated, Contractor needs to coordinate with the owner which option to choose.
4. Media: If more than one filter type is indicated, Contractor needs to coordinate with the owner which option to choose.

    a. Replaceable: Extended surface, panel, or cartridge with antimicrobial treatment fiber media.
    b. Washable: Manufacturer's standard filter with antimicrobial treatment.

G. Discharge-Air Grille Assembly: Mounted in bottom of unit cabinet.

1. Discharge Pattern: One-, two-, three-, or four-way throw as indicated on Drawings.

    a. Discharge Pattern Adjustment: Field-adjustable limits for up and down range of motion.
    b. Discharge Pattern Closure: Ability to close individual discharges of units with multiple patterns.

2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.
3. Additional Branch Supply Duct Connection: Sheet metal knockout for optional connection to one additional supply branch duct.

H. Return-Air Grille Assembly: Manufacturer's standard grille mounted in bottom of unit cabinet.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.

J. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.
2. Provide fresh air intake casement TRANE Part No. PAC-SH59KF-E or approved equal for all 33"x33" cassette units.

K. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors: Unit inlet air temperature.
4. Field-Customizable I/O Capability:

    a. Analog Inputs: Four for use in customizable control strategies.
    b. Digital Inputs: Four for use in customizable control strategies.
    c. Digital Outputs: Four for use in customizable control strategies.

5. Features and Functions: Self-diagnostics, time delay, auto-restart, auto operation mode, filter service notification, drain assembly high water level safety shutdown and notification, run test switch.
6. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
7. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
8. A factory-installed drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.
9. Communication: Network communication with other indoor units and outdoor unit(s).
10. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
11. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

L. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in metal raceways to comply with NFPA 70.

2.7 INDOOR, 4-WAY CEILING-RECESSED, CASSETTE WITH GRILLE FOR 24”X24” CEILING GRID UNITS

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to ductwork, piping, power, and controls field connections.

B. Cabinet:

1. The cabinet shall be a compact 22-7/16” wide x 22-7/16” deep so it will fit within a standard 24” square suspended ceiling grid.
2. Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
3. Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
4. Mounting: Manufacturer-designed provisions for field installation.
5. Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.
6. The cabinet panel shall have provisions for a field installed filtered outside air intake.
7. Branch ducting shall be allowed from cabinet.
8. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
9. The grille vane angles shall be individually adjustable from a wired remote controller to customize the airflow pattern for the conditioned space.

C. DX Coil Assembly:

1. Coil Casing: Aluminum, galvanized, or stainless steel.
2. Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.
3. Coil Tubes: Copper, of diameter and thickness required by performance.
4. Expansion Valve: Electronic modulating type with linear or proportional characteristics.
5. Internal Tubing: Copper tubing with brazed joints.
6. Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.
7. Field Piping Connections: Manufacturer's standard.
8. Factory Charge: Dehydrated air or nitrogen.
9. Testing: Factory pressure tested and verified to be without leaks.

D. Drain Assembly:

1. Pan: Non-ferrous material, with bottom sloped to low point drain connection.
2. Condensate Removal: The unit shall be provided with integral condensate lift mechanism capable of lifting drain water to not less than 19-3/4” inches from the condensate pan.
3. Field Piping Connection: Non-ferrous material with threaded NPT.

E. Fan and Motor Assembly:

1. Fan(s):

    a. Direct-drive arrangement.
    b. Fabricated from non-ferrous components or ferrous components with corrosion protection finish.
    c. Wheels statically and dynamically balanced.

2. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
3. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
4. The indoor fan shall be capable of three (3) speed settings, Low, Mid, and

5. High.
6. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
7. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.
8. Grille shall include an optional “3D i-see” sensor, or equal, to work in conjunction with indoor unit control sequence to prevent unnecessary cooling or heating in unoccupied areas of the zone without decreasing comfort levels. Sensor must detect occupancy (not simply motion) and location of occupants by measuring size & temperature of objects within a 39’ detecting diameter (based on 8.8ft mounting height) with 1,856 or more measuring points.
9. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
10. Speed Settings and Control: Two (low, high), three (low, medium, high), or more than
11. Vibration Control: Integral isolation to dampen vibration transmission.

F. Filter Assembly:

1. Access: Bottom or from a side, to accommodate filter replacement without the need for tools.
2. Efficiency: High efficiency
3. Media: If more than one filter type is indicated, Contractor needs to coordinate with the owner which option to choose.

    a. Replaceable: Extended surface, panel, or cartridge with antimicrobial treatment fiber media.
    b. Washable: Manufacturer's standard filter with antimicrobial treatment.

G. Discharge-Air Grille Assembly: Mounted in bottom of unit cabinet.

1. Discharge Pattern: One-, two-, three-, or four-way throw.

    a. Discharge Pattern Adjustment: Field-adjustable limits for up and down range of motion.
    b. Discharge Pattern Closure: Ability to close individual discharges of units with multiple patterns.

2. Motorized Vanes: Modulating up and down flow pattern for uniform room air distribution.

H. Return-Air Grille Assembly: Manufacturer's standard grille mounted in bottom of unit cabinet.

I. Outdoor Air Ventilation Connection: Sheet metal knockout for optional connection to outdoor air ventilation duct.

J. Unit Accessories:

1. Remote Room Temperature Sensor Kit: Wall-mounted, hardwired room temperature sensor kit for use in rooms that do not have room temperature measurement.

K. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors: Unit inlet air temperature.
4. Field-Customizable I/O Capability:

    a. Analog Inputs: Four for use in customizable control strategies.
    b. Digital Inputs: Four for use in customizable control strategies.
    c. Digital Outputs: Four for use in customizable control strategies.

5. Features and Functions: Self-diagnostics, time delay, auto-restart, auto operation mode, filter service notification, drain assembly high water level safety shutdown and notification, run test switch.
6. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
7. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
8. A factory-installed drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.
9. Communication: Network communication with other indoor units and outdoor unit(s).
10. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
11. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.

L. Unit Electrical:

1. Enclosure: Manufacturer's standard, and suitable for indoor locations.
2. Field Connection: Single point connection to power entire unit and integral controls.
3. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
4. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
5. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
6. Raceways: Enclose line voltage wiring in metal raceways to comply with NFPA 70.

2.8 OUTDOOR, HIGH EFFICIENCY AIR-SOURCE HEAT RECOVERY UNITS

A. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections.

1. Specially designed for use in systems with simultaneous heating and cooling.

2. Systems shall consist of one unit, or multiple unit modules that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit that connects multiple indoor units.
3. All units installed shall be from the same product development generation.
4. The outdoor unit modules shall be air-cooled, direct expansion (DX), multi-zone units used specifically with VRF components described in this section Controls below. The outdoor unit modules shall be equipped with a single compressor which is inverter-driven and multiple circuit boards—all of which must be manufactured by the branded VRF manufacturer. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
5. Outdoor unit systems may be comprised of multiple modules with differing capacity if a brand other than basis of design is proposed. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor. Contractor responsible for ensuring alternative brand compatibility in terms of availability, physical dimensions, weight, electrical requirements, etc.
6. Outdoor unit shall have a sound rating no higher than 68 dB(A) individually or 70 dB(A) twinned. Units shall have a sound rating no higher than 52 dB(A) individually or 55 dB(A) twinned while in night mode operation. Units shall have 5 levels sound adjustment via dip switch selectable fan speed settings.
7. Refrigerant lines from the outdoor unit to the indoor units shall be insulated and covered with PVC jacket above the insulation in accordance with the installation manual.
8. The outdoor unit shall have the capability of installing the main refrigerant piping through the bottom of the unit.
9. The outdoor unit shall have an accumulator with refrigerant level sensors and controls. Units shall actively control liquid level in the accumulator via Linear Expansion Valves (LEV) from the heat exchanger.
10. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
11. VRF system shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.
12. The outdoor unit shall be capable of operating in heating mode down to -25F ambient temperatures or cooling mode down to 23F ambient temperatures, without additional low ambient controls.
13. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained. Oil return sequences must be enabled only during extended periods of reduced refrigerant flow to ensure no disruption to correct refrigerant flow to individual zones during peak loads. Systems which might engage oil return sequence based on hours of operation risk oil return during inopportune periods are not allowed. Systems which rely on sensors (which may fail) to engage oil return sequence are not allowed.
14. Unit must defrost all circuits simultaneously in order to resume full heating more quickly during extreme low ambient temperatures (below 23F). Partial defrost, also known as hot gas defrost which allows reduced heating output during defrost, is permissible only when ambient temperature is above 23F.
15. While in hot gas defrost the system shall slow the indoor unit fan speed down to maintain a high discharge air temperature, systems that keep fan running in same state shall not be

allowed as they provide an uncomfortable draft to the indoor zone due to lower discharge air temperatures.

16. In reverse defrost all refrigerant shall be bypassed in the main branch controller and shall not be sent out to the indoor units, systems that flow refrigerant through indoor units during reverse defrost shall not be allowed.

B. Cabinet:

1. Galvanized steel and coated with a corrosion-resistant finish.

    a. Coating with documented salt spray test performance of 1000 hours according to ASTM B117 surface scratch test (SST) procedure.

2. Mounting: Manufacturer-designed provisions for field installation.
3. Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.
4. Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs the salt spray protection is compromised and the panel should be replaced immediately.

C. Compressor and Motor Assembly:

1. Each outdoor unit module shall be equipped with only inverter driven scroll hermetic compressors. Non inverter-driven compressors, which may cause inrush current (demand charges) and require larger generators for temporary power shall not be allowed.
2. Each compressor shall be equipped with a multi-port discharge mechanism to eliminate over compression at part load. Manufacturer's that rely on a single compressor discharge port and provide no means of eliminating over compression and energy waste at part load shall not be allowed.
3. Crankcase heat shall be provided via induction-type heater utilizing eddy currents from motor windings. Energy-wasting "belly-band" type crankcase heaters are not allowed. Manufacturers that utilize belly-band crankcase heaters will be considered as alternate only.
4. Compressor shall have an inverter to modulate capacity. The capacity for
5. each compressor shall be variable with a minimum turndown not greater
6. than 15%.
7. The compressor shall be equipped with an internal thermal overload.
8. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.
9. Manufacturers that utilize a compressor sump oil sensor to equalize compressor oil volume within a single module shall not be allowed unless they actively shut down the system to protect from compressor failure.
10. Protection: Integral protection against the following:

    a. High refrigerant pressure.
    b. Low oil level.
    c. High oil temperature.
    d. Thermal and overload.
    e. Voltage fluctuations.
    f. Phase failure and phase reversal.

g. Short cycling.

11. Speed Control: Variable to automatically maintain refrigerant suction and condensing pressures while varying refrigerant flow to satisfy system cooling and heating loads.
12. Vibration Control: Integral isolation to dampen vibration transmission.
13. Oil management system to ensure safe and proper lubrication over entire operating range.
14. Fusible plug.

D. Condenser Coil Assembly:

1. Outdoor Coil shall be constructed to provide equal airflow to all coil face surface are by means of a 4-sided coil.
2. Outdoor Coil shall be elevated at least 12" from the base on the unit to protect coil from freezing and snow build up in cold climates.
3. Manufacturer's in which their coil extends to within a few inches from the bottom of their cabinet frame shall provide an additional 12" of height to their stand or support structure to provide equal protection from elements as per Basis of Design manufacturer by Mitsubishi Electric basis of design. Any additional support costs, equipment fencing, and tie downs required to meet this additional height shall be responsibility of Mechanical Contractor to provide.
4. The outdoor heat exchanger shall be of zinc coated aluminum construction with turbulating flat tube construction. The coil fins shall have a factory applied corrosion resistant finish. Uncoated aluminum coils/fins are not allowed.
5. The coil shall be protected with an integral metal guard.
6. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
7. Unit shall have prewired plugs for optional panel heaters in order to prevent any residual ice buildup from defrost. Panel heaters are recommended for operating environments where the ambient temperature is expected to stay below -1F for 72 hours.
8. Condenser coil shall have active hot gas circuit direct from compressor discharge on lowest coil face area to shed defrost condensate away from coil and protect from Ice formation after returning to standard heat pump operation. While in Heat Pump operation this lower section of the Outdoor Evaporator coil shall continually run hot gas from the compressor discharge to protect the coil from ice buildup and coil rupture.
9. Manufacturers who do not have an active hot gas circuit in the lower section of the Outdoor coil to protect coil from freezing shall not be allowed to bid on project in markets where the outdoor unit will see temperatures below freezing.

10. Aluminum Microchannel Coils:

    a. Series of flat tubes containing a series of multiple, parallel-flow microchannels layered between refrigerant header manifolds.
    b. Single- or multiple-pass arrangement.
    c. Construct fins, tubes, and header manifolds of aluminum alloy.

E. Condenser Fan and Motor Assembly:

1. Fan(s): Propeller type.

    a. Direct-drive arrangement.

b. Fabricated from non-ferrous components or ferrous components with corrosion protection finish to match performance indicated for condenser coil.
c. Statically and dynamically balanced.

2. Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with corrosion-resistant coating to match performance indicated for condenser coil.
3. Each outdoor unit module shall be furnished with direct drive, variable speed propeller type fan(s) only. Fans shall be factory set for operation at 0 in. WG. external static pressure, but capable of normal operation with a maximum of 0.32 in. WG. external static pressure via dipswitch.
4. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
5. Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.
6. Speed Settings and Control: Variable speed with a speed range of least 75 percent.
7. Vibration Control: Integral isolation to dampen vibration transmission.

F. Drain Pan: If required by manufacturer's design, provide unit with non-ferrous drain pan with bottom sloped to a low point drain connection.

G. Unit Controls:

1. Enclosure: Manufacturer's standard, and suitable for unprotected outdoor locations.
2. Factory-Installed Controller: Configurable digital control.
3. Factory-Installed Sensors:

a. Refrigerant suction temperature.
b. Refrigerant discharge temperature.
c. Outdoor air temperature.
d. Refrigerant high pressure.
e. Refrigerant low pressure.
f. Oil level.

4. Features and Functions: Self-diagnostics, time delay, auto-restart, fuse protection, auto operation mode, night setback control, power consumption display, run test switch, equalize run time between multiple same components.
5. Communication: Network communication with indoor units and other outdoor unit(s).
6. Cable and Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
7. Field Connection: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
8. The unit shall be an integral part of the system & control network section and react to heating/cooling demand as communicated from connected indoor units over the control circuit. Required field-installed control voltage transformers and/or signal boosters shall be provided by the manufacturer.
9. Each outdoor unit module shall have the capability of 4 levels of demand control based on external input.

H. Unit Electrical:

1. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz or 460 volts, 3-phase, 60 hertz per equipment schedule.
2. The outdoor unit shall be controlled by integral microprocessors.
3. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
4. Enclosure: Metal, similar to enclosure, and suitable for unprotected outdoor locations.
5. Field Connection: Single point connection to power entire unit and integral controls.
6. Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.
7. Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.
8. Wiring: Manufacturer's standard with each connection labeled and corresponding to a unit-mounted wiring diagram.
9. Raceways: Enclose line voltage wiring in metal raceways to comply with NFPA 70.

I. Unit Hardware: Zinc-plated steel, or stainless steel. Coat exposed surfaces with additional corrosion-resistant coating if required to prevention corrosion when exposed to salt spray test for 1000 hours according ASTM B117.

J. Unit Piping:

1. Unit Tubing: Copper tubing with brazed joints.
2. Unit Tubing Insulation: standard insulation, of thickness to prevent condensation.
3. Field Piping Connections: Manufacturer's standard.
4. Factory Charge: Dehydrated air or nitrogen.
5. Testing: Factory pressure tested and verified to be without leaks.

K. Special Requirements:

1. Provide refrigerant vibration absorber for VRF system at each refrigerant pipe connection between the outdoor heat recovery unit and the field provided distribution refrigerant pipes.

2. Manufacturers:

   a. Metraflex (Basis of Design, Model VAVRF8)
   b. Packless Industries
   c. Grainger Approved

3. Construction:

   a. Type: Sweat Connection
   b. Overall length: 12 inches or as recommended by manufacturer.
   c. Connection material: Copper
   d. Material: Stainless steel, bronze, bronze hose, bronze braid, brazed joints, copper ferrule, female copper tube end.
   e. Maximum Working Pressure: 650 PSI
   f. Minimum Temperature rating: 300 deg. F
   g. Suitable for refrigerant R410 and other type of refrigerants

e. Copper tube meets as a standard B16.18-1950 and ASA 16.22-1951.
f. Type of end connections: Brazed welded joints.
g. Application: Refrigerant systems in which line vibrations need to be minimized to reduce system noise transmission and stress relief in the piping system.
h. Compliance: Tested and recognized by UL

2.9 HEAT RECOVERY CONTROL UNITS (HRCUs) OR BRANCH CIRCUIT (BC) CONTROLLERS (OR COMPARABLE BRANCH DEVICES)

A. General

1. 1. BC (Branch Circuit) Controllers (or comparable branch devices) shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices which do not include controlled refrigerant subcooling risk bubbles in liquid supplied to indoor unit LEVs and are not allowed.
2. BC Controllers (or comparable branch devices) shall be equipped with a circuit board that interfaces to the controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish and be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. BC Controllers (or comparable branch devices) shall be suitable for use in plenums in accordance with UL1995 ed 4.
3. Each BC branch controller shall include minimum one extra branch circuit port for future use.

B. BC Unit Cabinet:

1. The casing shall be fabricated of galvanized steel.
2. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
3. The unit shall house two tube-in-tube heat exchangers.
4. Refrigerant Piping (specifications in addition to those for outdoor unit):

    a. All refrigerant pipe connections shall be brazed.
    b. Future changes to indoor unit quantities or sizes served by BC Controller or comparable branch device must be possible with no piping changes except between the branch device and indoor unit(s) changing. Systems which might require future piping changes between branch device and outdoor unit—if changes to indoor unit quantities or sizes are made—are not considered equal and are not allowed.

5. Refrigerant valves:

    a. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.

6. Condensate Management:

    a. BC Controller (or comparable branch device) must have integral resin drain pan or insulate refrigeration components with removable insulation that allows easy access for future service needs. Cabinets filled with solid foam insulation do not allow for future service and are not allowed.

7. Electrical:

    a. The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz) or 207-253 (230/60Hz).
    b. The BC Controller shall be controlled by integral microprocessors
    c. The control circuit between the indoor units and outdoor units shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.10 SYSTEM REFRIGERANT AND OIL

A. Refrigerant:

1. As required by VRF HVAC system manufacturer for system to comply with performance requirements indicated.
2. ASHRAE 34 refrigerant classification.
3. R-410a

B. Oil:

1. As required by VRF HVAC system manufacturer and to comply with performance requirements indicated.

2.11 SYSTEM CONDENSATE DRAIN PIPING

A. Comply with requirements in Section 232113 – “Hydronic piping”.

2.12 SYSTEM REFRIGERANT PIPING

A. Comply with requirements in Section 232300 "Refrigerant Piping" for system piping requirements.

2.13 METAL HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 – “Hangers and supports for HVAC piping and equipment”

2.14 PIPING AND TUBING INSULATION

A. Comply with requirements in Section 230719 "HVAC Piping Insulation" for system piping insulation requirements.

2.15 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect factory-assembled equipment.

B. Equipment will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports for historical record. Submit reports only if requested.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine products before installation. Reject products that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for piping and tubing to verify actual locations of connections before equipment installation.

D. Examine roughing-in for ductwork to verify actual locations of connections before equipment installation.

E. Examine roughing-in for wiring and conduit to verify actual locations of connections before equipment installation.

F. Examine walls, floors, roofs, and outdoor pads for suitable conditions where equipment will be installed.

G. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION, GENERAL

A. Clearance:

1. Maintain manufacturer's recommended clearances for service and maintenance.
2. Maintain clearances required by governing code.

B. Loose Components: Install components, devices, and accessories furnished by manufacturer, with equipment, that are not factory mounted.

1. Loose components shall be installed by manufacturer's service representative or system Installer under supervision of manufacturer's service representative.

C. Equipment Restraint Installation: Install equipment with seismic-restraint device. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

3.3 INSTALLATION OF INDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Unless otherwise required by VRF HVAC system manufacturer, support ceiling-mounted units from structure above using threaded rods; minimum rod size of 3/8 inch.

C. Adjust supports of exposed and recessed units to draw units tight to adjoining surfaces.

D. Protect finished surfaces of ceilings, floors, and walls that come in direct contact with units. Refinish or replaced damaged areas after units are installed.

E. In rooms with ceilings, conceal piping and tubing, controls, and electrical power serving units above ceilings.

F. In rooms without ceiling, arrange piping and tubing, controls, and electrical power serving units to provide a neat and finished appearance.

G. Provide lateral bracing if needed to limit movement of suspended units to not more than 0.25 inch.

H. For wall-mounted units that are exposed, conceal piping and tubing, controls, and electrical power serving units within walls.

I. Attachment: Install hardware for proper attachment to supported equipment.

J. Grouting: Place grout under equipment supports and make bearing surface smooth.

3.4 INSTALLATION OF OUTDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. Install outdoor units on support structures indicated on Drawings.

C. Roof-Mounted Installations: Install outdoor units on equipment supports in compliance with the specification 230548 - Vibration and Wind Controls for HVAC.

3.5 GENERAL REQUIREMENTS FOR PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping and tubing systems. Install piping and tubing as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping and tubing in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping and tubing at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping and tubing above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping and tubing to permit valve servicing.

F. Install piping and tubing at indicated slopes.

G. Install piping and tubing free of sags.

H. Install fittings for changes in direction and branch connections.

I. Install piping and tubing to allow application of insulation.

J. Install groups of pipes and tubing parallel to each other, spaced to permit applying insulation with service access between insulated piping and tubing.

K. Install sleeves for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

L. Install escutcheons for piping and tubing penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.6 INSTALLATION OF SYSTEM CONDENSATE DRAIN PIPING

A. General Requirements for Drain Piping and Tubing:

1. Install a union in piping at each threaded unit connection.
2. Install an adjustable stainless-steel hose clamp with adjustable gear operator on unit hose connections. Tighten clamp to provide a leak-free installation.
3. If required for unit installation, provide a trap assembly in drain piping to prevent air circulated through unit from passing through drain piping. Comply with more stringent of the following:

    a. Details indicated on Drawings.
    b. Manufacturer's requirements.

c. Governing codes.
d. In the absence of requirements, comply with requirements of ASHRAE handbooks.

4. Extend drain piping from units with drain connections to drain receptors as indicated on Drawings. If not indicated on Drawings, terminate drain connection at nearest accessible location that is not exposed to view by occupants.
5. Provide each 90-degree change in direction with a Y- or T-fitting. Install a threaded plug connection in the dormant side of fitting or future use as a service cleanout.

B. Gravity Drains:

1. Slope piping from unit connection toward drain termination at a constant slope of not less than two percent.

C. Pumped Drains:

1. If unit condensate pump or lift mechanism is not included with an integral check valve, install a full-size check valve in each branch pipe near unit connection to prevent backflow into unit.

3.7 INSTALLATION OF REFRIGERANT PIPING

A. Refrigerant Tubing Kits:

1. Unroll and straighten tubing to suit installation. Deviations in straightness of exposed tubing shall be unnoticeable to observer.
2. Support tubing using hangers and supports indicated at intervals not to exceed 5 feet. Minimum rod size, 1/4 inch.
3. Prepare tubing ends and make mating connections to provide a pressure tight and leak-free installation.

B. Install refrigerant piping according to ASHRAE 15 and governing codes.

C. Select system components with pressure rating equal to or greater than system operating pressure.

D. Install piping as short and direct as possible, with a minimum number of joints and fittings.

E. Arrange piping to allow inspection and service of equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

F. Install refrigerant piping and tubing in protective conduit where installed belowground.

G. Install refrigerant piping and tubing in rigid or flexible conduit in locations where exposed to mechanical damage.

H. Unless otherwise required by VRF HVAC system manufacturer, slope refrigerant piping and tubing as follows:

1. Install horizontal hot-gas discharge piping and tubing with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps to entrain oil in vertical runs.
4. Liquid lines may be installed level.

I. When brazing, remove or protect components that could be damaged by heat.

J. Before installation, clean piping, tubing, and fittings to cleanliness level required by VRF HVAC system manufacturer.

K. Joint Construction:

1. Ream ends of tubes and remove burrs.
2. Remove scale, slag, dirt, and debris from inside and outside of tube and fittings before assembly.
3. Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

a. Use Type BCuP (copper-phosphorus) alloy for joining copper fittings with copper tubing.
b. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze.

3.8 INSTALLATION OF DUCT, ACCESSORIES, AND AIR OUTLETS

A. Where installing ductwork adjacent to equipment, allow space for service and maintenance.

B. Comply with requirements for metal ducts specified in Section 233113 "Metal Ducts."

C. Comply with requirements for air duct accessories specified in Section 233300 "Air Duct Accessories."

D. Comply with requirements for flexible ducts specified in Section 233346 "Flexible Ducts."

E. Comply with requirements for air diffusers specified in Section 233713.13 "Air Diffusers."

F. Comply with requirements for registers and grilles specified in Section 233713.23 "Registers and Grilles."

3.9 ELECTRICAL INSTALLATION

A. Comply with requirements indicated on Drawings and in applicable Division 26 Sections.

B. To extent electrical power is required for system equipment, components, and controls, and is not indicated on Drawings and addressed in the Specifications, the design for such electrical power shall be delegated to VRF HVAC system provider.

1. Delegated design of electrical power to equipment, components and controls, and associated installation shall be included at no additional cost to Owner.

C. Connect field electrical power source to each separate electrical device requiring field electrical power. Coordinate termination point and connection type with Installer.

D. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

E. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems" for grounding connections.

F. Install nameplate or acrylic label with self-adhesive back for each electrical connection indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated phenolic layers of black with engraved white letters. Letters at least 1/2 inch high.
2. Locate nameplate or label where easily visible.

G. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or revised in this Section.

H. Install manufactured conduit sweeps and long-radius elbows if possible.

I. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.10 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

3.11 GROUNDING INSTALLATION

A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.

B. For low-voltage control cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.12 IDENTIFICATION

A. Identify system equipment, piping, tubing, and valves. Comply with requirements for identification specified in Section 230553 "Identification for HVAC Piping and Equipment."

B. Identify system electrical and controls components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify each control cable on each end and at each terminal with a number-coded identification tag. Each cable shall have a unique tag.

3.13 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage VRF HVAC system manufacturer's service representative to advise and assist installers; witness testing; and observe and inspect components, assemblies, and equipment installations, including controls and connections.

1. Field service shall be performed by a factory-trained and -authorized service representative of VRF HVAC system manufacturer whose primary job responsibilities are to provide direct technical support of its products.

2. Manufacturer shall provide on-site visits during the course of construction at installation milestones indicated. System Installer shall coordinate each visit in advance to give manufacturer sufficient notice to plan the visit.

   a. First Visit: Kick-off meeting.
   b. Second Visit: At approximately 25 percent completion of system(s).
   c. Third Visit: At approximately 50 percent completion of system(s).
   d. Fourth Visit: At approximately 75 percent completion of system(s).
   e. Fifth Visit: Final inspection before system startup.

3. Kick-off Meeting:

   a. Meeting shall include system Installer and other related trades with sole purpose of reviewing VRF HVAC system installation requirements and close coordination required to make a successful installation.
   b. Meeting shall be held at Project site and scheduled at a mutually agreed to time that occurs before the start of any part of system installation.
   c. Meeting shall cover the following as a minimum requirement:

      1) Review of latest issue of Contract Documents, Drawings, and Specifications, relevant to VRF HVAC systems.
      2) Manufacturer's installation requirements specific to systems being installed.
      3) Review of all relevant VRF HVAC system submittals, including delegated-design submittals.
      4) Required field activities related installation of VRF HVAC system.
      5) Project team communication protocol, contact information, and exchange of responsibilities for each party involved, including manufacturer, supplier, system Installer, and other related trades.

4. Site Visits: Activities for each site visit shall include the following:

   a. Meet with VRF HVAC system Installer to discuss field activities, issues, and suggested methods to result in a successful installation.
   b. Offer technical support to Installer and related trades as related to VRF system(s) being installed.

c. Review progress of VRF HVAC system(s) installation for strict compliance with manufacturer's requirements.
d. Advise and if necessary assist Installer with updating related refrigerant calculations and system documentation.
e. Issue a report for each visit, documenting the visit.

1) Report to include name and contact information of individual making the visit.
2) Date(s) and time frames while on-site.
3) Names and contact information of people meeting with while on-site.
4) Clearly identify and list each separate issue that requires resolution. For each issue, provide a unique identification number, relevant importance, specific location or equipment identification, description of issue, recommended corrective action, and follow-up requirements needed. Include a digital photo for clarification if deemed to be beneficial.

5. Final Inspection before Startup:

a. Before inspection, Installer to provide written request to manufacturer stating the system is fully installed according manufacturer's requirements and ready for final inspection.
b. All system equipment and operating components shall be inspected. If components are inaccessible for inspection, they shall be made accessible before the final inspection can be completed.
c. Manufacturer shall provide a comprehensive inspection of all equipment and each operating component that comprise the complete system(s). Inspection shall follow a detailed checklist specific to each equipment and operating component.

d. Installer shall provide manufacturer with the requested documentation and technical support during inspection.
e. Installer shall correct observed deficiencies found by the inspection.
f. Upon completing the on-site inspection, manufacturer shall provide a written report with complete documentation describing each inspection step, the result, and any corrective action required.
g. If corrective action is required by Installer that cannot be completed during the same visit, provide additional visits, as required, until deficiencies are resolved and systems are deemed ready for startup.
h. Final report shall indicate the system(s) inspected are installed according to manufacturer's requirements and are ready for startup.

B. Perform the following tests and inspections with the assistance of manufacturer's service representative:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Refrigerant Tubing Positive Pressure Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing installation, pressurize tubing systems to a test pressure of not less than 1.5 times VRF HVAC system operating pressure, but not less than 600 psig, using dry nitrogen.
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of 24 hours. Allowance for pressure changes attributed to changes in ambient temperature are acceptable.
4. Prepare test report to record the following information for each test:

    a. Name of person starting test, company name, phone number, and e-mail address.
    b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
    c. Detailed description of extent of tubing tested.
    d. Date and time at start of test.
    e. Test pressure at start of test.
    f. Outdoor temperature at start of test.
    g. Name of person ending test, company name, phone number, and e-mail address.
    h. Date and time at end of test.
    i. Test pressure at end of test.
    j. Outdoor temperature at end of test.
    k. Remarks:

5. Submit test reports for Project record.

D. Refrigerant Tubing Evacuation Testing:

1. Comply with more stringent of VRF HVAC system manufacturer's requirements and requirements indicated.
2. After completion of tubing positive-pressure testing, evacuate tubing systems to a pressure of 500 microns.
3. Successful testing shall maintain a test pressure for a continuous and uninterrupted period of one hour(s) with no change.
4. Prepare test report to record the following information for each test:

    a. Name of person starting test, company name, phone number, and e-mail address.
    b. Name of manufacturer's service representative witnessing test, company name, phone number, and e-mail address.
    c. Detailed description of extent of tubing tested.
    d. Date and time at start of test.
    e. Test pressure at start of test.
    f. Outdoor temperature at start of test.
    g. Name of person ending test, company name, phone number, and e-mail address.
    h. Date and time at end of test.
    i. Test pressure at end of test.

j. Outdoor temperature at end of test.
k. Remarks:

5. Submit test reports for Project record.
6. Upon successful completion of evacuation testing, system shall be charged with refrigerant.

E. System Refrigerant Charge:

1. Using information collected from the refrigerant tubing evacuation testing, system Installer shall consult variable refrigerant system manufacturer to determine the correct system refrigerant charge.
2. Installer shall charge system following VRF HVAC system manufacturer's written instructions.
3. System refrigerant charging shall be witnessed by system manufacturer's representative.
4. Total refrigerant charge shall be recorded and permanently displayed at the system's outdoor unit.

F. Products will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

3.14 STARTUP SERVICE

A. Engage a VRF HVAC system manufacturer's service representative to perform system(s) startup service.

1. Service representative shall be a factory-trained and -authorized service representative of VRF HVAC system manufacturer.
2. Complete startup service of each separate system.
3. Complete system startup service according to manufacturer's written instructions.

B. Startup checks shall include, but not be limited to, the following:

1. Check control communications of equipment and each operating component in system(s).
2. Check each indoor unit's response to demand for cooling and heating.
3. Check each indoor unit's response to changes in airflow settings.
4. Check each indoor unit, HRCU, and outdoor unit for proper condensate removal.
5. Check sound levels of each indoor and outdoor unit.

C. Installer shall accompany manufacturer's service representative during startup service and provide manufacturer's service representative with requested documentation and technical support during startup service.

1. Installer shall correct deficiencies found during startup service for reverification.

D. System Operation Report:

1. After completion of startup service, manufacturer shall issue a report for each separate system.
2. Report shall include complete documentation describing each startup check, the result, and any corrective action required.
3. Manufacturer shall electronically record not less than two hours of continuous operation of each system and submit with report for historical reference.

    a. All available system operating parameters shall be included in the information submitted.

E. Witness:

1. Invite Owner to witness startup service procedures.
2. Provide written notice not less than 20 business days before start of startup service.

3.15 ADJUSTING

A. Adjust equipment and components to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature and humidity set points. Adjust initial airflow settings and discharge airflow patterns.

C. Set field-adjustable switches and circuit-breaker trip ranges according to VRF HVAC system manufacturer's written instructions, and as indicated.

3.16 PROTECTION

A. Protect products from moisture and water damage. Remove and replace products that are wet, moisture damaged, or mold damaged.

B. Protect equipment from physical damage. Replace equipment with physical damage that cannot be repaired to new condition. Observable surface imperfections shall be grounds for removal and replacement.

C. Protect equipment from electrical damage. Replace equipment suffering electrical damage.

D. Cover and seal openings of equipment to keep inside of equipment clean. Do not remove covers until finish work is complete.

3.17 DEMONSTRATION

A. Engage a VRF HVAC system manufacturer's factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain entire system.

B. Instructor:

1. Instructor shall be factory trained and certified by VRF HVAC system manufacturer with current training on the system(s), equipment, and controls that are installed.
2. Instructor's credentials shall be submitted for review by Owner before scheduling training.
3. Instructor(s) sole job responsibility shall be Owner training.
4. Instructor(s) shall have not less than three years of training experience with VRF HVAC system manufacturer and past training experience on at least three projects of comparable size and complexity.

C. Schedule and Duration:

1. Schedule training with Owner at least 20] business days before first training session.
2. Training shall occur before Owner occupancy.
3. Training shall be held at mutually agreed date and time during normal business hours.
4. Each training day shall not exceed eight hours of training. Daily training schedule shall allow time for one-hour lunch period and 15-minute break after every two hours of training.
5. Perform not less than eight total hours of training.

D. Location: Owner shall provide a suitable on-site location to host classroom training.

E. Training Attendance: For record purposes, document training attendees at the start of each new training session. Record attendee's name, signature, phone number, and e-mail address.

F. Training Format: Individual training modules shall include classroom training followed by hands-on field demonstration and training.

G. Training Materials: Provide training materials in electronic format to each attendee.

1. Include instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.
2. Video record each classroom training session and submit an electronic copy to Owner before requesting Owner acceptance of training.

H. Acceptance: Obtain Owner written acceptance that training is complete and requirements indicated have been satisfied.

END OF SECTION 238129

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 238236 – ELECTRIC BASEBOARD RADIATION HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes electric baseboard radiation heaters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include details and dimensions of custom-fabricated enclosures.
4. Indicate location and size of each field connection.
5. Indicate location and arrangement of piping valves and specialties.
6. Indicate location and arrangement of integral controls.
7. Include enclosure joints, corner pieces, access doors, and other accessories.
8. Include diagrams for power, signal, and control wiring.

C. Color Samples for Verification: For each type of exposed finish.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members, including wall construction, to which finned-tube radiation heaters will be attached.
2. Method of attaching finned-tube radiation heaters to building structure.
3. Penetrations of fire-rated wall and floor assemblies.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 ELECTRIC BASEBOARD RADIATION HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chromalox.
2. Indeeco.
3. Markel Products Company.
4. Or approved equal.

B. Description: Factory-packaged units constructed according to UL 499, UL 1030, and UL 2021.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Heating Elements: Nickel-chromium-wire heating element enclosed in metallic sheath mechanically bonded to fins, with high-temperature cutout and sensor running the full length of the element. Element supports shall eliminate thermal expansion noise.

D. Rust-Resistant Enclosures: Minimum 0.040-inch- or 0.052-inch- thick ASTM A653/A653M, G60 (Z180) galvanized-steel, removable front cover.

1. Full-height back.
2. Full-length damper.
3. End panel.
4. End]caps.
5. Inside and outside corners.
6. Joiner pieces to snap together.
7. Enclosure Height: as indicated on drawings.
8. Enclosure Depth: as indicated on drawings.
9. Finish: Baked-enamel finish in manufacturer's standard color as selected by Architect.
10. Element Brackets: Primed and painted steel to support front panel and element.

E. Unit Controls: Remote line-voltage thermostat.

F. Accessories:

1. Filler sections without a heating element matching the adjacent enclosure.
2. Straight-blade-type receptacles complying with DSCC W-C-596G/GEN, NEMA WD 1, NEMA WD 6, and UL 498; in color selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive finned-tube radiation heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical connections to verify actual locations before installation of finned-tube radiation heaters.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BASEBOARD RADIATION HEATER INSTALLATION

A. Install units level and plumb.

B. Install enclosure continuously around corners, using outside and inside corner fittings.

C. Join sections with splice plates and filler pieces to provide continuous enclosure.

D. Install access doors for access to valves.

E. Install enclosure continuously from wall to wall.

F. Terminate enclosures with manufacturer's end caps except where enclosures are indicated to extend to adjoining walls.

G. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect steam finned-tube radiation heaters and components to piping according to

C. Ground electric radiation heaters according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. After electrical circuitry has been energized, start units to confirm proper operation.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 238236

Department of Community Affairs
Construction Project Review
Project No: 9184-23
partial release
mechanical
Thomas Williams
Released: 10/24/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 238239.16 – ELECTRIC UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes propeller unit heaters with electric-resistance heating coils.

1.3 DEFINITIONS

A. PTFE: Polytetrafluoroethylene plastic.

B. TFE: Tetrafluoroethylene plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings:
   1. Include plans, elevations, sections, and details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include location and size of each field connection.
   4. Include details of anchorages and attachments to structure and to supported equipment.
   5. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
   6. Indicate location and arrangement of integral controls.
   7. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Suspended ceiling components.
   2. Structural members to which propeller unit heaters will be attached.
   3. Method of attaching hangers to building structure.
   4. Size and location of initial access modules for acoustical tile.

5. Items penetrating finished ceiling, including the following:
   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Access panels.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For propeller unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. Assembly including casing, coil, fan, and motor in vertical and horizontal discharge configuration with adjustable discharge louvers.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with UL 2021.

2.2 PERFORMANCE REQUIREMENTS

A. SHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. Unit heaters shall be furnished in accordance with the schedule shown on the Contract Drawings.

2.3 ELECTRIC UNIT HEATER

A. Manufacturers:

1. Trane (Basis of design, Model UHEC)
2. Markel
3. Indeeco
4. Or Approved equal.

B. General

1. Heaters shall be installed and wired in accordance with the manufacturer's recommendations and applicable national and local codes.

C. Casing

1. Casings fabricated of die-formed, heavy gauge steel and finished in high gloss, baked enamel. Supply air shall be drawn through a stamped louver periphery evenly across the heating element, and discharged through an outward drawn venturi. Adjustable discharge louvers shall be provided to control the direction of airflow. A large, hinged access door shall extend the width of the heater and locked in position by quarter-turn fasteners. Heater and supply wiring diagram shall be permanently attached to the inside of the access door.

D. Elements

1. Elements shall be high mass, all steel tubular finned type, copper brazed. Centrally located and installed in fixed element banks.

E. Motors

1. Motors shall be totally enclosed, all angle industrial rated. All units 3.3 through 20 kW will utilize sealed bearings to assure permanent lubrication.

F. Fan Blades

1. Fan blades shall be of the axial flow type designed for quiet efficient operation. Fan speed does not exceed 1,600 rpm .

G. Wiring

1. Heaters designed for a single circuit, with elements, motor and control circuits subdivided with factory wired fuses to conform to the National Electric Code and Underwriter's Laboratory, Inc., Standard 1278. All three-phase heaters shall have balanced phases.

H. Thermal Overload Protection

1. All heaters shall be equipped with automatic reset thermal overloads which shut down the element and motor if safe operating temperatures are exceeded.

I. Fusing

1. Element, motor and transformer primary fusing are factory installed and wired where required by NEC. Branch circuit fusing is installed where required (48 amps and up).

J. Control

1. Contactors and control circuit transformers where required are factory installed and wired. Only direct line supply and thermostat connections in the field are required. Built-in fan override is provided to purge unit casing of excess heat after unit shutdown. The units are listed under the Reexamination Service of Underwriter's Laboratories, Inc. Units are warranted to be free from defective material and workmanship for a period of one year with the exception of the heating elements which are warranted for five years.

K. Electrical

1. NEMA 12 disconnect switch supplied by contractor.

2.4 ELECTRIC UNIT HEATER

A. Manufacturers:

1. Trane (Basis of design, Model UHCA)
2. Markel
3. Indeeco
4. Or approved equal.

B. General

1. Contractor shall supply and install heavy duty ceiling-mounted forced-air electric heater(s) of the wattage, voltage and phase as indicated on the plans. The heater is designed to provide an even distribution of heated air to the space to be heated by drawing return air in the periphery of the heater, across and through the element and be discharged from the center section of the heater by means of an electric motor and axial flow fan blade.
2. Heaters that are recessed type and mounted flush with the finished ceiling or surfaced mounted to extend no more than 8 9/16" from the finished ceiling.

C. Surface Mounted

1. Enclosure are constructed of 1/16" x 3/8" rounded edge horizontal steel louvers which are spaced for maximum opening of 5/16". Louvers are welded at every intersection to evenly spaced 1/8" diameter vertical members. Discharge grille to have concentric rings for uniform air discharge. Grille assembly are attached to chassis by tamper-resistant (Allen head) machine screws. All parts of enclosure are heavy gauge steel, zinc coated both sides and finished in neutral, off- white colored, baked enamel.

D. Motor

1. Motors are permanently lubricated, unit bearing, totally enclosed shaded pole type with impedance protection. Motors operate at no more than 1,300 rpm and are the same voltage as the heater.

E. Performance

1. Heaters have a rating of 425 cfm at 710 fpm with a maximum temperature rise of 44 F and 63.9 DB RE 10-12 watt.

F. Elements

1. Element assemblies consist of two or three corrosion-resistant, steel- sheathed type elements mechanically bonded to common corrosion-resistant steel fins. Each sheathed element consist of helically coiled nickel chromium alloy resistant wire completely embedded in and surrounded by magnesium oxide, enclosed and wedged into corrosion resistant steel sheaths. Elements have 2" cold conductor pins extending into sheath and have a density of no more than 60 watts per inch.

G. Thermal Overload

1. Heaters are be equipped with manual reset thermal limit control that disconnects elements and motor in the event normal operating temperatures are exceeded. For safety, if opened due to abnormal temperatures, thermal overload will remain open until manually reset by turning heater off for five minutes. Automatic reset thermal overloads which allow the element to continue to cycle under abnormal conditions will not be accepted.

H. Approval
   1. Heaters are ETL listed. Heaters conform to Underwriters' Standard 1025.

2.5 ELECTRIC UNIT HEATER

A. Manufacturers:

   1. Trane (Basis of design, Model UHAA)
   2. Markel
   3. Indeeco
   4. Or approved equal.

B. Furnish and install heavy-duty forced air wall heaters.

C. Heaters are architectural styled, constructed of a 18-gauge steel housing with a 14-gauge extruded aluminum frame. The rugged steel grille and heater box are painted with a rust resistant dark brown baked enamel color finish. Rough-in dimensions of 19 3/16" (high x 14 3/16" wide x 4" deep. Power wiring is connected through two 1/2" knockouts in the top of the heater and one ½ knockout on the bottom of the heater.

D. The heaters have a low-speed 600 rpm, four-pole motor which drives a vane axial blower to deliver a quiet 175 cfm of down flow air.

E. The heating element are of the sealed tubular type with large, parallel steel fins for quick heat transfer.

F. Unit's have as standard, thermal overload cut-off for added safety, fan delay switch, manual tamper resistant disconnect switch and a tamper resistant thermostat which are calibrated to provide a range of 55 F to 85 F . All items factory installed and wired.

G. All heaters are listed by ETL listed.

H. The heating element are supplied with a manufacturer's one - year limited warranty.

2.6 CONTROLS FOR ALL HEATERS

A. Control Devices:

   1. Wall-mounted thermostat.
   2. Thermostat range 45°F to 90°F.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive propeller unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical connections to verify actual locations before unit-heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install propeller unit heaters to comply with NFPA 90A.

B. Install propeller unit heaters level and plumb.

C. Suspend propeller unit heaters from structure with all-thread hanger rods and spring hangers. Hanger rods and attachments to structure are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Vibration hangers are specified in Section 230548 "Vibration and Wind Controls for HVAC."

E. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

B. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

D. Operate electric heating elements through each stage to verify proper operation and electrical connections.

E. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

G. Units will be considered defective if they do not pass tests and inspections.

H. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial temperature set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain propeller unit heaters.

END OF SECTION 238239.16

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

260500 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic Electrical Requirements specifically a
Division 1 - General Requirements.

1.2 SCOPE

A. This scope covers the furnishing, installation, testing, adjusting and placing in operation all electrical equipment, devices, facilities, materials, and auxiliary items necessary for the complete and successful operation of all electrical equipment as herein described, shown on the plans, or deemed necessary for the completion of the electrical portion of the project. It is the intent of DIVISION 26 to outline the electrical requirements of the contract in order to provide the information necessary for the construction of a fully operational system as shown on the plans and as herein described. A comprehensive electrical scope of work is as follows:
1. Power/Electrical System
2. Generator Systems
3. Lighting System
4. Utility Work
5. Connection of Electrically Powered Mechanical Equipment
6. Lightning Protection and Grounding System
7. Temporary Construction Power
8. All Incidentals Necessary for a Complete and Fully Operational Electrical System.

1.3 WORKING CLEARANCES

A. Working clearances around equipment requiring electrical services shall be verified by Contractor to comply with Code requirements. Should there be apparent violations of clearances; the Contractor shall notify the Engineer before proceeding with connection or placing of equipment.

B. In the case of panelboards, safety switches and other equipment requiring wire and cable terminations, the Contractor shall ascertain that lug sizes and wiring gutters or space allowed for proper accommodation and termination of the wires and cables are adequate.

1.4 WORKMANSHIP

A. Workmanship under this Division shall be accomplished by persons skilled in the performance of the required task. All work shall be done in keeping with conventions of the trade. Work of this Division shall be closely coordinated with work of other trades to avoid conflict and interference.

1.5 PROTECTION OF ELECTRICAL EQUIPMENT

A. Electrical equipment shall be protected by the weather, especially from water dripping or splashing upon it, at all times during shipment, storage and after installation. Should any apparatus be subjected to possible injury by water, it shall be thoroughly dried out and put through a dielectric test, at the expense of the contractor, to ascertain the suitability of this apparatus. The results of the test shall be submitted to the Engineer and if the apparatus is found to be unsuitable, the contractor shall replace it without additional cost to the Owner.

1.6 UTILITIES

A. The electrical contractor shall install a fully operational electrical service as described in the plans.

B. Arrange with the utility company for the services and install the services in accordance with their requirements, regulations and recommendations.

1.7 GUARANTEE

A. Contractor shall guarantee all LED, drivers, and starters shall be guaranteed for a period of one (1) year after the building is occupied. Guarantee shall include material and labor for re-lamping.

B. The Contractor shall guarantee all other electrical systems, materials and workmanship to be free from defects for a period of one (1) year from the date of final acceptance. He shall correct all defects arising within this period upon notification by the Owner or Engineer, without additional compensation.

C. It is understood that the rights and benefits given the Owner by the guarantees found in the technical specifications are in addition to and not in derogation of any rights or benefits found in the special and general provisions of the contract.

1.8 TEMPORARY POWER AND LIGHTS DURING CONSTRUCTION

A. It shall be the responsibility of the Contractor to provide and maintain adequate temporary power and lighting at all times during construction, so that the various other trades can accomplish their work in a flawless manner. Particular attention will be given to power and lighting for masonry, drywall, painting, tile work and any other finish work.

1.9 MATERIAL STANDARDS

A. Material shall be new and comply with standards of Underwriters' Laboratories, Inc., where standards have been established for the particular product and the various NEMA, ANSI, ASTM, IEEE, AEIC, IPCEA or other publications referenced.

1.10 TEST EQUIPMENT

A. The contractor shall provide all test equipment and supplies deemed necessary by the Engineer at no extra cost to the Owner. These supplies shall include but not be limited to the following: volt meters, amp meters, clamp-on ground rod test meter, light meters, generator load banks & temporary cables, watt meters, harmonic distortion test equipment, thermal image camera, megger tester, high pot test equipment, power quality analyzers, recording power meter, and oscilloscopes.

1.11 REFERENCES

A. ANSI/NFPA 70 – National Electrical Code.

B. ANSIC2 – National Electrical Safety Code.

C. NEMA – National Electrical Manufacturer's Assoc.

D. UL – Underwriters Laboratories

E. NFPA – National Fire Protection Assoc.

F. IEEE – The Institute of Electrical and Electronics Engineers

G. IESNA – The Illuminating Engineering Society of North America

H. NETA – International Electrical Testing Association

I. API – American Petroleum Institute

J. AGA – American Gas Association

1.12 SUBMITTAL

A. Submit under provisions of the General Provisions.
   1. The Contractor installing all Electrical work shall review and approve all electrical shop drawings prior to submittal to the Engineer for review. As part of the review, the installer shall certify the following:
      a. I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is in compliance with the contract drawing and specifications, can be installed in the allocated space, will be stored in accordance with the manufacturers recommendation, will be installed per NEC, and is submitted for approval.

         Certified by: _____ Date: _____

B. Submit shop drawings and product data grouped to include complete submittal of related systems, products, and accessories in a single submittal. No electrical work may be performed until shop drawings are approved. Submit Shop Drawings on the Following Systems as Grouped Below:
   1. High Voltage Distribution System

a. Transformers
b. Switches
c. Distribution Equipment
d. High Voltage Cable
e. Equipment Pads
f. Utility Conduit/Fittings/Warning tape
g. Miscellaneous Materials
h. Utility Work

2. Low Voltage Power/Electrical System
   a. Conduit and Conduit Fittings
   b. Wire
   c. Pull Boxes
   d. Panelboards
   e. Panelboard Layouts
   f. Circuit Breakers
   g. Disconnects
   h. Fuses
   i. Conduit Support Systems
   j. Wiring Devices
   k. Switchboards
   l. Transformers
   m. Surge Protection Equipment
3. Generator Equipment
   a. ATS Equipment
4. Lighting System
   a. All Light Fixtures
      1) Computer Printout of Lighting Layout
      2) Sample Fixture (as directed by Engineer)
      3) IES Photometric Files
5. Miscellaneous Electrical Equipment
   a. Miscellaneous Electrical Parts
6. Drawings
   a. Coordination drawing of All Electrical Room
   b. Conduit layout drawings
   c. Duct drawings
   d. As-Built Drawings

C. Mark dimensions and values in units to match those specified.

1.13 REGULATORY REQUIREMENTS

1. Conform to applicable sections of the Building Code and all local rules, regulations and ordinances.
2. Electrical: Conform to NFPA 70 & National Electric Safety Code
3. Obtain permits, and request inspections from authority having jurisdiction.
4. References listed in Paragraph 1.11, this section.

1.14 FINAL INSPECTION AND TESTING

A. After the electrical installation is complete, the Contractor shall deliver to the Engineer the following information with his request for final inspection.
   1. One set of contract drawings marked to show all significant changes in equipment ratings and locations, alterations in locations of conduit runs, or of any data differing from the contract drawings. This shall include revised or changed panelboard and switchgear schedules.
   2. Certificates of final inspection from local authority.
   3. A tabulation of all motors listing their respective manufacturer, horsepower, nameplate voltage and current, actual running current after installation and overload heater rating.

B. The electrical work shall be thoroughly tested to demonstrate that the entire system is in proper working order and in accordance with the plans and specifications. Each motor with its control shall be run as nearly as possible under operating conditions for a sufficient length of time to demonstrate correct alignment, wiring capacity, speed and satisfactory operation. All main switches and circuit breakers shall be operated, but not necessarily at full load. Contractor may be required during final inspection, at the request of the Engineer to furnish test instruments for use during the testing.

C. All wiring shall be given a megger test using a 1000 Volt megger for (1) one minute (60 seconds). This test shall be performed immediately after conductors are pulled, but before final connections are made to ensure cable pull has not damaged cables. The Engineer shall be given two (2) days' written notice of the anticipated test date so that he may witness the test if so desired. In any event, the Contractor shall record the circuit designation, date, temperature, humidity, and the megger reading phase to phase, phase to neutral, phase to ground, neutral to ground. Tests shall be done on individual conductors and not groups of conductors run in parallel. This written record shall be submitted to the Engineer. The cost of this test or any retest caused by insufficient megger readings shall be the responsibility of the Contractor (All tests shall be done in accordance with NETA Standards). Historical equipment calibration reports shall be available upon request.

1.15 AS-BUILT DRAWINGS

A. The contractor shall provide detailed as-built drawings for the project indicating all power wiring. (All Drawings shall be delivered to the Owner in an AutoCAD Format same version as the CD or other appropriate digital media containing the bid set.)

B. The As-Built drawings shall include detailed drawings of all duct banks, underground conduit, above ground conduit, motor control centers, PLC control panels, control drawings. These drawings shall indicate exact location of all underground electrical wiring and fiber optic cable.
   1. The location shall indicate the following
      a. Centerline location
      b. Width / Cross section
      c. Depth

C. The Engineer will provide electronic copies of all drawings in the bid plans set on a CD or other appropriate digital media for use by the contractor.

END OF SECTION 26500

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 26 05 13 - MEDIUM VOLTAGE CABLE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes furnishing, instal
and terminations as specified and indica

1.02 CITED STANDARDS

A. This Section incorporates by reference t

1. Basic Electrical Requirements s

2. Institute of Electrical and Electronics Engineers (IEEE)

a. IEEE 100 Standards Dictionary: Glossary of Terms and Definitions

b. IEEE 400 Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems Rated 5 kV and Above

3. International Standards Organization (ISO)

a. ISO 9001 Quality Management Systems - Requirements

4. National Electrical Manufacturers Association (NEMA) and Insulated Cable Engineers Association (ICEA)

a. ANSI/NEMA WC 74 (ICEA S-93-639) 5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy.

5. National Fire Protection Associations (NFPA)

a. NFPA 70 National Electrical Code

b. NFPA 502

6. Underwriters Laboratories (UL)

a. UL 1072 Medium-Voltage Power Cables

1.03 DEFINITIONS

A. Manufacturing

1. The manufacturers of these cables, terminations, and splices shall be ISO 9001 certified.

2. These manufacturers shall have produced materials for similar applications for a minimum period of five (5) years. When requested by the Resident Engineer, an acceptable list of installations with similar materials shall be provided demonstrating compliance with this requirement.

3. Materials shall be UL listed and labeled when applicable.

B. Quality Assurance

1. The cable manufacturer shall have a minimum of 15 years manufacturing EPR insulated cables.

2. Cables shall be tested for corona discharge and shall comply with AEIC requirements. A copy of the original x-y plot showing discharge levels shall be included as part of the certified test reports. Submit test report for Architect/Engineer review prior to installation.

1.04 DELIVERY, STORAGE AND HANDLING

A. Suitably protect cables and materials against possible damage during handling, shipping, and storage.

B. Ship and store the cables and materials packed as necessary to prevent damage from handling and exposure to weather. Suitably seal cable ends to prevent the entrance of moisture and contamination.

C. Deliver materials to the project site(s) as directed and required.

D. Deliver cables on suitable reels in lengths selected to minimize waste.

PART 2 - PRODUCTS

2.01 MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, AVAILABLE MANUFACTURERS OFFERING PRODUCTS THAT MAY BE INCORPORATED INTO THE WORK INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:

a. CABLES:

1) Aetna Insulated Wire, Inc.; a Berkshire Hathaway company.

2) General Cable Technologies Corporation.

3) Kerite; a Marmon Wire & Cable/Berkshire Hathaway company.

4) Okonite Company (The).

5) Prysmian Cables & Systems.

6) Southwire Company.

7) Or approved equal.

b. CABLE SPLICING AND TERMINATING PRODUCTS AND ACCESSORIES:

1) Adalet; a Scott Fetzer company.

2) DSG-Canusa; a Shawcor company.

3) Engineered Products Company.

4) G&W Electric Company.

5) MP Husky.

6) RTE Components; Cooper Power Systems, Inc.

7) Thomas & Betts Corporation.

8) Thomas & Betts Corporation/Elastimold.

9) 3M; Electrical Markets Division.

10) Tyco Electronics; Raychem Products.

11) Or approved equal.

2.02 INSULATED CABLES

A. Description

1. Conductors shall be Class B stranded copper, size as indicated or required.

2. Insulation: Cross-linked Polyolefin insulation, 100%, MV-90

3. Insulation shielding: semi-conducting non-metallic extrusion over insulation, and copper foil or tape shield.

4. Listed as low/limited smoke per NFPA 130.

5. Listed as suitable for wet locations.

6. Identified as suitable for the application.

7. Voltage Rating: 5 kV.

8. Single conductor, insulated and shielded, size as indicated.

B. Terminations

1. Outdoor-rated, silicone rubber, suitable for shielded cables, 3M Cold Shrink QT-III, Prysmian Group Cold-Shrink Termination PICT15XX-CF, TE Cold-Shrink Termination EH type, or approved equal.

2. Lugs shall be two- or four-hole compression type, suitable for the conductor type (copper), and suitable for the equipment to which the cable will be terminated, with ampacity rating such that the temperature rating of the attached cable and equipment will not be exceeded under conditions of continuous full load current.

C. Splices

1. Outdoor-rated, silicone rubber, suitable for shielded cables as specified, 3M Cold Splice QS-III, Eaton SP5A series, TE Cold-Shrink In-line splice CSJA type, or approved equal.

D. Design Criteria

1. Cable will be installed in rigid steel conduit subject to NFPA 70 rules.

2. Under normal conditions, ambient temperature will not exceed 40 degrees Celsius.

3. Suitable for wet and dry locations.

E. Tests

1. Conduct factory tests in accordance with NEMA WC 53 (ICEA T-27-581), and submit certified test reports. Cables shall be tested in accordance with NETA testing requirements.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.02 PREPARATION

A. Ascertain that raceway system has been properly installed and cleaned before installing cables per Section 26 05 33, Raceway and Boxes for Electrical Systems.

3.03 INSTALLATION

A. Install Medium Voltage Cables in raceways as specified after raceway system has been completed and cleaned. The equipment and methods for the installation of medium voltage cable shall ensure that no cuts or abrasions in the insulation or protective covering or kinks in the conductors occur.

B. Pull medium voltage cable into conduit with sufficient length remaining at the ends to conveniently make connections to all equipment or devices. Do not exceed manufacturer's recommended pulling tension.

C. The minimum radius to which medium voltage cable is bent shall be 12 times the outer diameter and not less than manufacturer's recommendations.

D. Use a non-conducting lubricant or cable-pulling compound recommended by the manufacturer.

E. Furnish and install cable supports as required to prevent tension being placed on terminations.

F. Splices will be permitted only in accessible locations, and with engineering and owner approval.

G. Terminate medium voltage cables with stress relief cones or special termination fitting, installed strictly in accordance with the instructions of the cable or termination manufacturer. Eliminate all moisture from the taping, to build the cone to the specified dimensions, and to properly terminate and ground the outer shield conductor. Only one end of the shield wire shall be connected to the grounding system.

H. Cable on reels shall be stored and protected from damage. Proper precaution shall be taken in handling reels to prevent damage to the cable.

I. Bond and ground shields per Section 26 05 26, Grounding and Bonding for Electrical Systems.

J. Check all terminations for proper crimping, improper wire exposure, and other defects prior to attaching to equipment terminal lugs. Replace defective terminations at the Contractor's expense.

K. Replace cable damaged during installation at the Contractor's expense.

3.04 TAGGING

A. Identify cables with permanent labels as required by Section 26 05 00, Common Work Results for Electrical.

B. Label each cable with the circuit number, phase, and completion date.

3.05 SITE QUALITY CONTROL

A. Tests on Completed Cables

1. Provide test instruments and qualified personnel to perform tests on completed cables.

2. Perform tests in accordance with the manufacturer's recommendations and IEEE 400 guidelines. Cables shall be tested in accordance with NETA testing requirements.

3. Insulated medium voltage cable Dielectric Tests: After the wiring is installed and all terminations are completed, but before making connections to equipment terminals, test the cable insulation.

4. Conduct Voltage and Insulation Tests.

5. Check all cables for continuity and insulation integrity prior to connecting to devices and equipment.

6. Check phase rotation from incoming source and equipment being terminated prior to termination.

7. Final Continuity Tests:

a. Conduct continuity tests after wiring connections to equipment have been made.

b. If a failure is detected, locate and determine the cause, make necessary corrections to the installation, and retest.

8. Submit certified field test reports and certify that the completed installation is ready for energization.

3.06 NON-CONFORMING WORK

A. Repair or replace cables and termination that fail testing requirements.

3.07 PROTECTION

A. Maintain seals on the ends of medium voltage cables until terminations or splices have been properly applied and tested.

B. While cables, terminations, and splices are being installed, protect them from physical damage.

C. Replace box covers and equipment access covers any time cables and terminations will be left unattended.

3.08 SYSTEMS START-UP

A. The medium-voltage cable system shall be energized by not loaded for a minimum of 24 hours prior to placing loads on the system. During this initial energization period, monitor the system with “on-line” partial discharge instruments, and report any degradation that occurs.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 260519 - LOW-VOLTAGE ELECTRICAL I

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. Section Includes:

1. Wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:
1. Division 26 and 28.

1.3 DEFINITIONS

A. VFD: Variable frequency drive.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

C. Standard Test Record Sheet/s.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
1. Alpha Wire.
2. Belden Inc.
3. Encore Wire Corporation.

4. General Cable Technologies Corporation.
5. Southwire Incorporated.
6. Or Approved Equal.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658. Unless specifically shown on the plans as Aluminum.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2, Type XHHW-2, RHW-2 Low Smoke, SOW and Type SO.

D. VFD Cable:

1. Comply with UL 1277, UL 1685, and NFPA 70 for Type TC-ER cable.
2. Type TC-ER with oversized crosslinked polyethylene insulation, dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.
3. Comply with UL requirements for cables in Classes I and II, Division 2 hazardous location applications.
4. Cable shall be rated for 1000V unless otherwise indicated

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Gardner Bender.
3. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. Ilsco; a branch of Bardes Corporation.
6. NSi Industries LLC.
7. O-Z/Gedney; a brand of the EGS Electrical Group.
8. 3M; Electrical Markets Division.
9. Tyco Electronics.
10. Or Approved Equal.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. General Branch Circuits in building for lighting and receptacles: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger, except VFD cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Non- Industrial Facilities
   1. Service Entrance: Type THHN-THWN, single conductors in raceway.
   2. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.
   3. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
   4. Feeders in Cable Tray: Type THHN-THWN, single conductors in raceway.
   5. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
   6. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
   7. Branch Circuits in Cable Tray: Type THHN-THWN, single conductors in raceway.
   8. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
   9. Class 1 Control Circuits: Type THHN-THWN, in raceway.
   10. Class 2 Control Circuits: Type THHN-THWN, in raceway.

B. VFD Output Circuits: Type TC-ER cable with dual tape shield.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Division 26 prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B. All torque tighting equipment shall be calibrated before use with calibration records available for inspection.

B. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to the project specifications.

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Record all results and submit to engineer for approval. Certify compliance with manufacturer’s test parameters, in the absence of Manufacturer’s published data, certify compliance with the table listed in NETA Acceptance Testing Specification.

2. All testing must be carried out be competent persons.

3. NETA Acceptance Testing Specification is the minimum level of testing that will be required on all projects with the most relevant inspection and test procedures extracted as

listed below. The following list includes additional tests that will be required unless stated otherwise.

Pre-connection:

a. Visual and Mechanical inspection.
b. Perform resistance measurements through bolted connections with a low resistance DC Ohmmeter or an insulation resistance test meter.
c. Continuity of all protective conductors to be recorded using a low resistance DC Ohmmeter or an insulation resistance test meter.
d. Check continuity of all conductors and verify correct cable connections.
e. Check polarity of all conductors.
f. Perform insulation-resistance megger test on each conductor with respect to ground and all adjacent conductors using an insulation resistance test meter. Each conductor must be tested for 1 minute.
g. Verify uniform resistance of all parallel conductors.

Post-connection

h. Test and record the impedance at the supply origin.
i. Test and record the Ground fault loop impedance between all live conductors and ground at the furthest extents of each final circuit. This test is to be completed using a Fault Loop Impedance tester and all results must be in compliance with the Circuit Protective Device (CPD) limits from the Manufacturer.
j. Test and record the operating trip time of all GFI and GFCI's devices to ensure compliance with NEC and Manufacturer's published data. This test is to be completed using a GFCI test meter.
k. Other functional testing may be listed here if required.

4. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. List of test personal with Resumes.
3. Summit all test results on the enclosed test form, see Appendix A.
4. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 260526 - GROUNDING AND BONDING F

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C Conditions and Division 01 Specification Sect

B. For definitions of grounding and bonding term

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1. Underground distribution grounding.
2. Ground bonding common with lightning protection system.
3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Instructions for periodic testing and inspection of grounding features at test wells ground rings grounding connections for separately derived systems based on NETA MTS

1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Harger Lightning and Grounding.
4. ILSCO.
5. O-Z/Gedney; A Brand of the EGS Electrical Group.
6. Robbins Lightning, Inc.
7. Siemens Power Transmission & Distribution, Inc
8. Or approved equal

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.

5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

D. Grounding & Bonding Conductors
1. All raceways and equipment shall be provided with an Equipment Grounding Conductor as shown on the drawings. When the Equipment Grounding Conductor is not shown on the drawings, provide an Equipment Grounding Conductor per Table 250.122 of the NEC
2. All Service Entrance Equipment shall be provided with a Grounding Electrode Conductor between the Service Entrance Ground and the Grounding Electrode System as shown on the drawings. When the Grounding Electrode Conductor is not shown on the drawing, provide a Grounding Electrode Conductor per Table 250.66 of the NEC.
3. Main Bonding Jumper installed between the Service Entrance Ground and Neutral and shall be sized per Table 250.66 of the NEC.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m) min.

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches (1200 mm) long.
2. Backfill Material: Electrode manufacturers recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductor level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard

grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

G. Metallic Fences: Comply with requirements of IEEE C2.

1. Grounding Conductor: Bare copper, not less than No. 8AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. When service grounding is not detailed on the drawings, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of area.

1. Install copper conductor not less than No. 2/0 AWG or as shown on the dtawing for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches (600 mm) from building's foundation.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal**,** at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81 and NETA Standards.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order,

and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 5ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer and include recommendations to reduce ground resistance.

END OF SECTION 260526

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 260529 - HANGERS AND SUPPORTS FOI

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof mounted electrical with structural and architectural specification and drawings.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. ERICO International Corporation.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut; Atkore International.
    g. Wesanco, Inc.
    h. or Approved Equal

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
4. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. Fabco Plastics Wholesale Limited.
    d. Seasafe, Inc.

e. or Approved Equal

2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
4. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices shall be as indicated below:
1. PVC Conduit – PVC, Fiberglass.
2. RGS Conduit – Galvanized Steel
3. PVC Coated RGS – Galvanized Steel.
4. EMT – Painted or Galvanized Steel

E. Cable Tray Supports shall be as indicated below:
1. Galvanized Steel – Galvanized or Stainless Steel
2. Fiberglass – Stainless Steel or a combination of Fiberglass and Stainless Steel
3. Aluminum – Stainless Steel

F. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

G. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

H. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Hilti, Inc.
2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.
5) or Approved Equal

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Cooper B-Line, Inc.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti, Inc.
4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
5) MKT Fastening, LLC.
6) or Approved Equal

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with single-bolt conduit clamps.

D. Install exposed raceways parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Exposed raceways in the open ceiling shall be routed in a neat, workmanship manner, and grouped together with other disciplines until final termination point where possible.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements as specified in the contract documents.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 260533 - RACEWAYS AND BOXES FOR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C
Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Boxes, enclosures, and cabinets.
6. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, hinged-cover enclosures, and cabinets.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney.
6. Picoma Industries.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company.
13. or Approved Equal.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel or aluminum.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel.
b. Type: compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corporation.
6. Condux International, Inc.
7. Electri-Flex Company.
8. Kraloy.
9. Carlon Electrical Products.
10. Niedax-Kleinhuis USA, Inc.
11. RACO; Hubbell.
12. Thomas & Betts Corporation.
13. or Approved Equal.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. RNC: Type EPC-40-PVC, or EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. LFNC: Comply with UL 1660.

F. Rigid HDPE: Comply with UL 651A.

G. Continuous HDPE: Comply with UL 651B.

H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

I. RTRC: Comply with UL 1684A and NEMA TC 14.

J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

K. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Mono-Systems, Inc.
4. Square D.
5. or Approved Equal.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 for interior or Type 4X stainless steel for exterior unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type for NEMA 1 and hinged, flanged-and-gasketed type for NEMA 4X unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Moulded Products, Inc.
2. Hoffman.
3. Carlon Electrical Products.
4. Niedax-Kleinhuis USA, Inc.
5. or Approved Equal.

B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Description: Fiberglass polyester or PVC, extruded and fabricated to required size and shape, and having hinged cover with captive screws.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Adalet.
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
4. Erickson Electrical Equipment Company.
5. FSR Inc.
6. Hoffman.
7. Hubbell Incorporated.
8. Kraloy.
9. Milbank Manufacturing Co.
10. Mono-Systems, Inc.
11. O-Z/Gedney.
12. RACO; Hubbell.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures.
16. Thomas & Betts Corporation.
17. Wiremold / Legrand.
18. or Approved Equal.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum to match raceway type, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

G. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).

1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover, unless otherwise noted.

J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

K. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep), unless otherwise noted.

L. Gangable boxes are prohibited, unless specifically noted.

M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4X Stainless Steel for outdoor locations, Type 12 for indoor locations, with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Fiberglass.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

N. Cabinets:

1. NEMA 250, Type 12 for indoor locations, with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. NewBasis.
d. Oldcastle Precast, Inc.
e. Quazite: Hubbell Power System, Inc.
f. Synertech Moulded Products.

g. Or approved equal.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, as required to identify system indicated on the drawings.
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of fiberglass unless otherwise noted.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. NewBasis.
d. Nordic Fiberglass, Inc.
e. Oldcastle Precast, Inc; Christy Concrete Products.
f. Quazite: Hubbell Power System, Inc; Hubbell Power Systems.
g. Synertech Moulded Products.
h. Or Approved Equal.

2. Standard: Comply with SCTE 77.
3. Color of Frame and Cover: Gray.
4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, as required to identify system indicated on the drawings
8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
9. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.7 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.

2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated

2. Exposed Conduit: GRC.
3. Concealed Conduit, Aboveground: GRC, unless otherwise indicated on drawings.
4. Underground Conduit: RNC, Type EPC-40-PVC when concrete encased, Type EPC-80-PVC when direct buried,
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC unless otherwise indicated on drawings
6. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X stainless steel, unless otherwise indicated on drawings.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
   a. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   b. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC unless otherwise noted.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4X stainless steel in commercial kitchens and damp or wet locations, unless otherwise noted.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm) of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 3 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Engineer for each specific location.
5. Change from ENT to GRC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Surface Raceways:

1. Install surface raceway with a minimum 2-inch (50-mm) radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

2. Where an underground raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:
1. Provide expansion joint fitting any time conduit systems cross building expansion joints or structural expansion joints.
2. Provide expansion fittings as recommended by the manufacturer of the conduit.
3. Provide expansion fittings per NFPA 70.
4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
3. Provide a separate ground for all flex conduits.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between boxes and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.

2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction per 95% modified proctor density.
3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor. Wrap conduit with 2 coats of 3M Scotch Wrap or Approved Equal.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
4. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.5 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping." If Section 078413 is not included as part of the project specifications, provide fire rated penetrations based on the fire proofing material being supplied. All penetrations through fire rated walls shall be fire proofed.

3.6 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 260544 - SLEEVES AND SLEEVE SE CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Advance Products & Systems, Inc.
    b. CALPICO, Inc.
    c. Metraflex Company (The).
    d. Pipeline Seal and Insulator, Inc.
    e. Proco Products, Inc.
    f. Or approved equal.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Presealed Systems.

    b. PRO-LINE FITTINGS

    c. OZ Gedney

    d. Or approved equal.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
2. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.

4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 260553 – IDENTIFICATION FOR ELECT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C Conditions and Division 1 Specification Secti

1.2 SUMMARY

A. This Section includes the following:
1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1, ANSI C2, and ANSI Z635.4.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

E. Install all signs and labels horizontal (level) and consistent for similar equipment and panels.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength: 50 lb, minimum.
   3. Temperature Range: Minus 40 to plus 185 deg F.
   4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 9 painting Sections.

PART 3 - EXECUTION

3.1 APPLICATION

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with snap-around label.
   1. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:
   1. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
   2. Fire Alarm System: Red.
   3. Fire-Suppression Supervisory and Control System: Red and yellow.
   4. Combined Fire Alarm and Security System: Red and blue.
   5. Security System: Blue and yellow.
   6. Mechanical and Electrical Supervisory System: Green and blue.
   7. Telecommunication System: Green and yellow.
   8. Control Wiring: Green and red.

C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and hand holes use metal tags. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
   1. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.
   1. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

E. Conductor Color Code Identification: Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a given branch circuit shall be identified by color coded tape or cable insulation at all termination, connection or splice points.

F. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.
   1. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

   2. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
   3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
   4. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway. During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches above duct. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
   1. Description:
      a. Permanent, bright-colored, continuous-printed, polyethylene tape.
      b. Not less than 6 inches wide by 4 mils thick.
      c. Compounded for permanent direct-burial service.
      d. Embedded continuous metallic strip or core.
      e. Printed legend shall indicate type of underground line.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
   1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
      a. Power transfer switches.
      b. Controls with external control power connections. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
   2. Comply with NFPA 70 and 29 CFR 1910.145.
   3. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
   4. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.
   5. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.
   6. Warning label and sign shall include, but are not limited to, the following legends:
      a. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
      b. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

J. Instruction Signs:
   1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with ENGINEER/OWNER instructions where needed for system or equipment operation. Instructions are needed for all equipment unless otherwise noted.
      a. Signs shall be engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
      b. The engraved legend shall be ½ " White letters on Brown face, and punched or drilled for mechanical fasteners.
      c. The signs shall be installed with stainless hardware.

   2. Emergency Operating Instructions: Install emergency operating instruction signs at equipment used for power transfer, safety shutdown, or any other locations requiring operation in an emergency.
      a. Signs shall be engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
      b. The engraved legend shall be ½ " White letters on Red face, and punched or drilled for mechanical fasteners.
      c. The signs shall be installed with stainless hardware.

K. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
   1. Labeling Instructions:
      a. Indoor and Outdoor Equipment: Use engraved, laminated acrylic or melamine labels, punched or drilled for screw mounting. Identification labels shall have white letters on a dark-gray background. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high. Mount labels with stainless hardware.
      b. Elevated Components: Increase the size of the labels and letters to those appropriate for viewing from the floor.
   2. Equipment to Be Labeled:
      a. Identification labeling of some items listed below may be required by individual Sections or by NFPA 70.
      b. Panelboards, electrical cabinets, and enclosures.
      c. Access doors and panels for concealed electrical items.
      d. Electrical switchgear and switchboards.
      e. Transformers.
      f. Electrical substations.
      g. Emergency system boxes and enclosures.
      h. Disconnect switches.
      i. Enclosed circuit breakers.
      j. Motor starters.
      k. Push-button stations.
      l. Power transfer equipment.
      m. Contactors.
      n. Battery inverter units.
      o. Battery racks.

p. Power-generating units.
q. Voice and data cable terminal equipment.
r. Television/audio components, racks, and controls.
s. Fire-alarm control panel and annunciators.
t. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
u. Monitoring and control equipment.
v. Uninterruptible power supply equipment.
w. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.
x. Control systems
y. Field mounted control devices
z. Field mounted instruments

3.2 INSTALLATION PRACTICES

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

D. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
1. Color shall be factory applied or, for sizes LARGER than No. 10 AWG if authorities having jurisdiction permit, field applied.
2. Colors for 208/120-V Circuits:
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.
   d. Neutral: White.
3. Colors for 480/277-V Circuits:
   a. Phase A: Brown.
   b. Phase B: Orange.
   c. Phase C: Yellow.
   d. Neutral: Gray
4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
5. Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, the color codes used to identify each phase, neutral (if applicable) and ground conductor throughout the system shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment. Provide factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

E. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

F. Painted Identification: Prepare surface and apply paint according to Division 9 painting Sections.

END OF SECTION 260553

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C
Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. Section Includes:

1. Time switches.
2. Indoor occupancy sensors.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.
2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Invensys Controls.
4. Leviton Manufacturing Co., Inc.
5. NSi Industries LLC; TORK Products.
6. Tyco Electronics; ALR Brand.
7. Or approved equal.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 30-A inductive or resistive, 240-V ac
4. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.
5. Astronomic Time: All channels.
6. Automatic daylight savings time changeover.
7. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bryant Electric.
2. Cooper Industries, Inc.
3. Hubbell Building Automation, Inc.
4. Leviton Manufacturing Co., Inc.
5. Lightolier Controls.
6. Lithonia Lighting; Acuity Brands Lighting, Inc.
7. Lutron Electronics Co., Inc.
8. NSi Industries LLC; TORK Products.
9. RAB Lighting.
10. Sensor Switch, Inc.
11. Square D.
12. Watt Stopper.
13. Or approved equal.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.

C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.

D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).

E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bryant Electric.
2. Cooper Industries, Inc.
3. Hubbell Building Automation, Inc.
4. Leviton Manufacturing Co., Inc.
5. Lightolier Controls.
6. Lithonia Lighting; Acuity Brands Lighting, Inc.
7. Lutron Electronics Co., Inc.
8. NSi Industries LLC; TORK Products.
9. RAB Lighting.
10. Sensor Switch, Inc.
11. Square D.
12. Watt Stopper.
13. Or approved equal.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor Tag WS1:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of [900 sq. ft. (84 sq. m)] [2100 sq. ft (196 sq. m)].
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP, manual "on," automatic "off."
4. Voltage: Match the circuit voltage.

5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

D. Wall-Switch Sensor Tag WS2:

1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
2. Sensing Technology: PIR.
3. Switch Type: SP, manual "on," automatic "off."
4. Voltage: Match the circuit voltage.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Lighting control devices will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to four visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

END OF SECTION 260923

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 261116.11 - SECONDARY UNIT SUBSTA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C
Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. Section includes secondary unit substations, each consisting of medium-voltage primary incoming section, transformer section, and low-voltage secondary switchgear section, with the following features:

1. Indoor enclosure.
2. Medium-voltage, metal-enclosed switchgear section.
3. Dry-type transformer.
4. Fused Interrupter switch with incoming utility metering section.

B. Related Requirements:

1. Section 260513 "Medium-Voltage Cables" for requirements for terminating cables in incoming section of substation.

1.3 DEFINITIONS

A. BIL: Basic insulation level.

B. MCC: Motor-control center.

C. MVA: Megavolt ampere.

D. NETA ATS: Acceptance testing specification.

E. NiCd: Nickel cadmium.

F. PCB: Polychlorinated biphenyl.

G. RTD: Resistance temperature device.

H. SCR: Silicon-controlled rectifier.

I. SPD: Surge protective device.

J. VRLA: Valve-regulated lead acid.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.
2. Dimensioned plans and elevations showing major components and features.

a. Include a plan view and cross section of equipment base, showing clearances, manufacturer's recommended workspace that accounts for breaker service and removal, and locations of penetrations for grounding and conduits.

3. One-line diagram.
4. List of materials.
5. Nameplate legends.
6. The material, size and number of bus bars, and current rating for each bus, including mains and branches of phase, neutral, and ground buses.
7. Short-time and short-circuit current ratings of secondary unit substations and components.
8. Ratings of individual protective devices.
9. Mimic-bus diagram.

C. Time-Current Characteristic Curves: For overcurrent protective devices.

D. Primary Fuses: Submit recommendations and size calculations.

1. Utility company's metering provisions with indication of approval by utility company.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings for Indoor Installations:

1. Location plan, showing heavy equipment or truck access paths for maintenance and replacement.
2. Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved.
3. Dimensioned concrete base, outline of secondary unit substation, conduit entries, and grounding equipment locations.
4. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways.
5. Location of lighting fixtures, sprinkler piping and heads, ducts, and diffusers.

B. Qualification Data: For testing agency.

C. Seismic Qualification Certificates: For transformer assembly, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For secondary unit substations, signed by product manufacturer.

E. Factory test reports.

F. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For secondary unit substations and accessories to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Spare Fuses: Six of each type and rating of fuse and fusible device used, except for medium-voltage fuses. Include spares for the following:

a. Primary disconnect fuses.
b. Potential transformer fuses.
c. Control power fuses.
d. Fuses and fusible devices for fused circuit breakers.
e. Fuses for secondary fusible devices.

2. Spare Indicating Lights: Six of each type installed.
3. Touchup Paint: Three half-pint containers of paint matching enclosure's exterior finish.
4. Primary Switch Contact Lubricant: One container(s).
5. Oneset(s) of spare mounting gaskets for bushings, handholes, and the gasket between relief cover and flange of pressure-relief device.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA or the National Institute for Certification in Engineering Technologies to supervise on-site testing.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver in shipping splits in sizes that can be moved past obstructions in delivery path.

B. Coordinate delivery of secondary unit substations to allow movement into designated space.

C. Store secondary unit substation components protected from weather and so condensation does not form on or in units. Provide temporary heating according to manufacturer's written instructions.

D. Handle secondary unit substation components according to manufacturer's written instructions. Use factory-installed lifting provisions.

1.10 FIELD CONDITIONS

A. Service Conditions: The unit substation shall be suitable for operation under service conditions specified as usual service conditions in IEEE C37.121, except for the following:

1. Exposure to significant solar radiation.
2. Altitudes above 3300 feet (1000 m).
3. Exposure to fumes, vapors, or dust.
4. Exposure to explosive environments.
5. Exposure to hot and humid climate or to excessive moisture, including steam, salt spray, and dripping water.
6. Exposure to seismic shock or to abnormal vibration, shock, or tilting.
7. Exposure to excessively high or low temperatures.
8. Unusual transportation or storage conditions.
9. Unusual grounding resistance conditions.
10. Unusual space limitations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Square D by Schneider Electric

B. Eaton

C. Siemens

D. Or approved equal.

2.2 SYSTEM DESCRIPTION

A. Description: Medium-voltage, primary incoming section; transformer section; and low-voltage secondary switchgear section; and including coordinated circuit breakers, fusible switches, and metering components.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with IEEE C2.
3. Comply with IEEE C37.121.
4. Comply with NFPA 70.

2.3 MANUFACTURED UNITS

A. Indoor Unit Arrangement: Single assembly

B. Connections between the primary device and transformer shall be cable, and between the transformer and secondary shall be flexible bus braid unless noted otherwise.

C. Indoor Enclosure: Steel.

D. Skid Mounted: Mount each shipping group on an integral base frame as a complete weatherproof unit.

E. Unit Substation Enclosures Finish: Factory-applied finish in manufacturer's standard color, including under surfaces treated with corrosion-resistant undercoating.

F. Unit Substation Enclosures Finish: Factory-applied finish in manufacturer's standard gray over a rust-inhibiting primer on treated metal surface.

2.4 MEDIUM-VOLTAGE TERMINAL COMPARTMENT SECTION

A. Primary Incoming Section: Terminal assembly with adequate space for incoming-cable terminations and surge arresters, complying with NEMA SG 4 and meeting thermal, mechanical, and dielectric requirements specified for the transformer section.

B. Ratings: Suitable for application in three-phase, 60-Hz, solidly grounded-neutral system.

C. System Voltage: 4.16 kV nominal; 4.76 kV maximum

D. Surge Arresters: Comply with IEEE C62.11, Distribution Class; metal-oxide-varistor type, connected in each phase of incoming circuit and ahead of any disconnecting device.

2.5 MEDIUM-VOLTAGE METAL-ENCLOSED SWITCHGEAR SECTION

A. Metal-enclosed, air-interrupter switchgear, with fuses, complying with IEEE C37.20.3.

1. Switchgear shall be arc resistant, complying with IEEE C37.20.7, Type 1

B. Ratings: Comply with IEEE C37.04; and suitable for application in three-phase, 60-Hz, solidly grounded-neutral system.

1. System Voltage: 4.16 kV nominal; 4.76 kV maximum.

2. Design Level of Available-Source Fault Current: Integrated short-circuit rating consistent with value of fault current indicated.
3. Main-Bus Rating: 600A, continuous.

C. Interrupter Switches: Stationary, gang operated, and suitable for application at maximum short-circuit rating of integrated switchgear assembly.

1. Rating: 600A continuous duty and load break.
2. Two-Time Duty-Cycle Fault Closing: 40,000 asymmetrical amperes.
3. Switch Action: No external arc and no significant quantities of ionized gas released into the enclosure.
4. Switch Construction: Supported entirely by interior framework of structure, with copper switchblades and stored-energy operating mechanism.
5. Phase Barriers: Full length of switchblades and fuses for each pole; designed for easy removal; allow visual inspection of switch components if barrier is in place.
6. Protective Shields: Cover live components and terminals.

    a. Fuse Mounts: Single-frame mounted and de-energized when switch is open.

7. Mechanical Interlock: Prevent opening of switch compartment door unless switchblades are open, and prevent closing switch if door is open.
8. Window: Permits viewing switchblade positions when door is closed.
9. Accessory Set: Tools and miscellaneous items required for interrupter switchgear test, inspection, maintenance, and operation. Include fuse-handling tool as recommended by switchgear manufacturer.

D. Fuses: Sizes recommended by secondary unit substation manufacturer, considering fan cooling, temperature-rise specification, and cycle loading.

1. Current-Limiting Fuses: Full-range, fast-replaceable, current-limiting type that will operate without explosive noise or expulsion of gas, vapor, or foreign matter from tube.
2. Expulsion Fuses: Furnished in disconnect-type mountings and renewable with replacement fuse units. Gases emitted on interruption are controlled and silenced by chambers designed for that purpose.
3. Indicator integral with each fuse to show when it has blown.
4. Spares: Include three fuses in use and three spare fuses in storage clips in each switch.

E. Surge Arresters: Comply with IEEE C62.11, Distribution Class; metal-oxide-varistor type, with ratings as indicated, connected in each phase of incoming circuit and ahead of any disconnecting device.

2.6 MEDIUM-VOLTAGE INSTRUMENTS SECTION

A. Instrument Transformers: Comply with IEEE C57.13.

1. Potential Transformers: Secondary voltage rating of 120 V and NEMA C 12.11 Accuracy Class of 0.3 with burdens of W, X, and Y.
2. Current Transformers: Burden and Accuracy Class suitable for connected relays, meters, and instruments.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems.

1. Inputs from sensors or 5-A current-transformer secondaries, and potential terminals rated to 600 V.
2. Switch-selectable digital display with the following features:

a. Phase Currents, Each Phase: Plus or minus 1 percent.
b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
d. Three-Phase Real Power: Plus or minus 2 percent.
e. Three-Phase Reactive Power: Plus or minus 2 percent.
f. Power Factor: Plus or minus 2 percent.
g. Frequency: Plus or minus 0.5 percent.
h. Integrated Demand, with Demand Interval Selectable from 5 to 60 Minutes: Plus or minus 2 percent.
i. Accumulated energy, in megawatt hours, plus or minus 2 percent; stored values unaffected by power outages for up to 72 hours.

3. Communications module suitable for remote monitoring of meter quantities and functions. Interface communication and metering requirements according to the utility requirements.
4. Mounting: Display and control unit that is flush or semiflush mounted in instrument compartment door.

2.7 DRY-TYPE TRANSFORMER SECTION

A. Description: IEEE C57.12.01, IEEE C57.12.51, and dry-type, two-winding, secondary unit substation transformer.

B. Primary Incoming Section: Transformer cover-mounted bushings. The bushings shall meet thermal, mechanical, and dielectric requirements as specified for the transformer section.

C. Style: Indoor, ventilated, vacuum-pressure, impregnated type, and with insulation system rated at 220 deg C with an 80 deg C average winding temperature rise above a maximum ambient temperature of 40 deg C.

D. Cooling System: Class AA, air cooled, complying with IEEE C57.12.01.

E. Insulation Materials: IEEE C57.12.01, rated 220deg C.

1. Insulation Temperature Rise: 150 deg C, maximum rise above 40 deg C.

F. BIL: 10 kV.

G. Full-Capacity Voltage Taps: Four nominal 2.5 percent taps, two above and two below rated primary voltage.

H. Full-Capacity Voltage Taps: Four nominal 2.5 percent taps below rated primary voltage.

I. Impedance: 5.75 +/- 7.5 percent.

2.8 SECONDARY DISTRIBUTION SECTION SWITCHGEAR

A. The secondary distribution section shall be drawout, fused where indicated, low-voltage switchgear, complying with IEEE C37.20.1 and UL 1558.

B. Switchgear Structure:

1. Match and align the front and back of the switchgear.
2. Isolate line bus from load bus at each main and tie circuit breaker with bus isolation barriers.
3. Allow the following circuit-breaker functions to be performed when the compartment door is closed:

    a. Operate manual charging system.
    b. Open and close the circuit breaker.
    c. Examine and adjust the trip unit.
    d. Read the breaker nameplate.

4. Locate instrumentation transformers within the breaker cell, and make front accessible and removable.

C. Switchgear Bus:

1. Use bus bars to connect compartments and vertical sections. Cable connections are not permitted.
2. Main Phase Bus: Uniform capacity the entire length of section.
3. Neutral Bus: 100 percent of phase-bus ampacity, except as indicated. Equip bus with pressure-connector terminations for outgoing circuit neutral conductors. Include braces for neutral-bus extensions for busway feeders.
4. Vertical Section Bus Size: Comply with IEEE C37.20.1, including allowance for spare circuit breakers and spaces for future circuit breakers.
5. Use silver-plated copper or tin-plated aluminum for connecting circuit-breaker line to aluminum bus.
6. Contact Surfaces of Buses: Silver plated.
7. Feeder Circuit-Breaker Load Terminals: Silver-plated copper bus extensions equipped with pressure connectors for outgoing circuit conductors.
8. Neutral bus equipped with pressure-connector terminations for outgoing circuit neutral conductors. Neutral-bus extensions for busway feeders are braced.
9. Bus-Bar Insulation: Individual bus bars wrapped with factory-applied, flame-retardant tape or spray-applied, flame-retardant insulation.

    a. Sprayed Insulation Thickness: 3 mils , minimum.
    b. Bolted Bus Joints: Insulate with secure joint covers that can easily be removed and reinstalled.

D. Circuit-Breaker Compartment:

1. Drawout Features: Circuit-breaker mounting assembly equipped with a racking mechanism to position circuit breaker and hold it rigidly in "connected," "test," and "disconnected" positions. Include the following features:

    a. Interlocks: Prevent movement of circuit breaker to or from "connected" position when it is closed, and prevent closure of circuit breaker unless it is in "connected," "test," or "disconnected" position.
    b. Circuit-Breaker Positioning: Permit the racking of an open circuit breaker to or from "connected," "test," and "disconnected" positions only when the compartment door is closed unless live parts are covered by a full dead-front shield. Permit the manual withdrawal of an open circuit breaker to a position for removal from the structure. When the compartment door is open, status for connection devices for different positions includes the following:

        1) Test Position: Primary disconnects disengaged, and secondary disconnect devices and ground contact engaged.
        2) Disconnected Position: Primary and secondary devices and ground contact disengaged.

2. Primary Disconnect: Mount on the stationary part of the compartment. The disconnect shall consist of a set of contacts extending to the rear through an insulating support barrier, and of corresponding moving finger contacts on the power circuit-breaker studs, which engage in only the "connected" position. The assembly shall provide multiple silver-to-silver full floating, spring-loaded, high-pressure-point contacts with uniform pressure on each finger. Load studs shall connect to bus extensions that terminate in solderless terminals in the rear cable compartment.
3. Secondary Disconnect: Floating terminals mounted on the stationary part of the compartment that engage mating contacts at the front of the breaker. Disconnecting devices shall be gold plated, and engagement shall be maintained in the "connected" and "test" positions.

E. Circuit Breakers:

1. Comply with IEEE C37.13 and UL 1066.
2. Ratings: For continuous, interrupting, and short-time current ratings for each circuit breaker; voltage and frequency ratings same as switchgear.

3. Trip Devices: Solid-state, overcurrent trip-device system consisting of one or two current transformers or sensors per phase, a release mechanism, and the following features:

    a. Functions: Long-time-delay, short-time-delay, and instantaneous-trip functions, independent of each other in both action and adjustment.
    b. Temperature compensation that ensures accuracy and calibration stability from minus 5 to plus 40 deg C.
    c. Field-adjustable, time-current characteristics.
    d. Current Adjustability: Dial settings and rating plugs on trip units, or sensors on circuit breakers, or a combination of these methods.
    e. Pickup Points:

        1) Five minimum, for long-time- and short-time-trip functions. Equip short-time-trip function for switchable I-squared-t operation.

2) Five minimum, for instantaneous-trip functions.

f. Ground-fault protection with at least three short-time-delay settings and three trip-time-delay bands; adjustable current pickup.

1) Arrange to provide protection for four-wire circuit or system.

4. Trip Indication: Labeled, battery-powered lights or mechanical targets on trip device to indicate type of fault.
5. Auxiliary Contacts:

a. Contacts and switches required for normal circuit-breaker operation, sufficient for interlocking and remote indication of circuit-breaker position.
b. Spare auxiliary switches, at least two, unless other quantity is indicated. Each switch shall consist of two Type A and two Type B contacts wired through secondary disconnect devices to a terminal block in stationary circuit-breaker compartment.

6. Arc Chutes: Readily removable from associated circuit breaker when it is in "disconnected" position and arranged to permit inspection of contacts without removing circuit breaker from switchgear.
7. Padlocking Provisions: For installing at least three padlocks on each circuit breaker to secure its enclosure and prevent movement of drawout mechanism.

2.9 IDENTIFICATION DEVICES

A. Compartment Nameplates: Engraved, laminated-plastic or metal nameplate for each compartment, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.10 SOURCE QUALITY CONTROL

A. Factory Tests: Perform design and routine tests according to standards specified for components. Conduct transformer tests according to IEEE C57.12.90. Conduct switchgear and switchboard tests according to NEMA C 37.51.

B. Factory Tests: Perform the following factory-certified tests on each secondary unit substation:

1. Resistance measurements of all windings on the rated voltage connection and on tap extreme connections.
2. Ratios on the rated voltage connection and on tap extreme connections.
3. Polarity and phase relation on the rated voltage connection.
4. No-load loss at rated voltage on the rated voltage connection.
5. Exciting current at rated voltage on the rated voltage connection.
6. Impedance and load loss at rated current on the rated voltage connection and on tap extreme connections.
7. Applied potential.
8. Induced potential.

9. Temperature Test: If a transformer is supplied with auxiliary cooling equipment to provide more than one rating, test at lowest kVA Class ONAN or Class AA rating and highest kVA Class ONAF or Class AFA rating.

    a. Temperature test is not required if a record of a temperature test on an essentially duplicate unit is available.

10. Owner will witness all required factory tests. Notify Architect at least 14 days before date of tests and indicate their approximate duration.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and space conditions for compliance with requirements for secondary unit substations and other conditions affecting performance of the Work.

B. Examine roughing-in of conduits and grounding systems to verify the following:

1. Wiring entries comply with layout requirements.
2. Entries are within conduit-entry tolerances specified by manufacturer, and no feeders will have to cross section barriers to reach load or line lugs.

C. Examine walls, floors, roofs, and concrete bases for suitable conditions for secondary unit substation installation.

D. Verify that ground connections are in place and that requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at secondary unit substation location.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with applicable portions of NECA 1, NECA 400, NECA 410, NECA 430, and NEMA SG 11.

B. Install secondary unit substations on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

C. Comply with requirements for vibration isolation and seismic control devices specified in Section 260529 "Hangers and Supports for Electrical Systems" and Section 260548.16 "Seismic Controls for Electrical Systems."

D. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Install the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet (9 m) apart.
2. Install arc-flash warning labels.

B. Operating Instructions: Place printed operating instructions for secondary unit substations, including key interlocking, control sequences, elementary single-line diagram, and emergency procedures with the maintenance materials.

3.4 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

1. At Interior Locations: For grounding to grounding electrodes, use bare copper cable not smaller than No. 4/0 AWG. Bond surge arrester and neutrals directly to the transformer enclosure and then to the grounding electrode system with bare copper conductors. Keep leads as short as practicable with no kinks or sharp bends. Make joints in grounding conductors and loops by exothermic weld or compression connector.

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.5 CLEANING

A. After completing equipment installation and before energizing, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish. Vacuum interiors of secondary unit substation sections.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections with the assistance of a factory-authorized service representative.

E. General Field Testing Requirements:

1. Comply with the provisions of NFPA 70B Ch. "Testing and Test Methods."
2. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

3. After installing secondary unit substation but before primary is energized, verify that grounding system at the substation is tested at the specified value or less.
4. After installing secondary unit substation and after electrical circuitry has been energized, test for compliance with requirements.
5. Visual and Mechanical Inspection:

    a. Verify equipment nameplate data complies with Contract Documents.
    b. Inspect bolted electrical connections for high resistance using one of the following two methods:

        1) Use a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
        2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

6. Remove and replace malfunctioning units and retest.
7. Prepare test and inspection reports. Record as-left set points of all adjustable devices.

F. Switchgear Field Tests:

1. Visual and Mechanical Inspection:

    a. Inspect physical and mechanical condition.
    b. Inspect anchorage, alignment, grounding, and required area clearances.
    c. Verify the unit is clean and shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.
    d. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study as well as to the address of the circuit breaker that is used to identify it in microprocessor-communication software.
    e. Verify that current and voltage-transformer ratios correspond to Drawings.
    f. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

        1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
        2) Make key exchange with devices operated in off-normal positions.

    g. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
    h. Inspect insulators for evidence of physical damage or contaminated surfaces.
    i. Verify correct barrier and shutter installation and operation.
    j. Exercise all active components.
    k. Inspect mechanical indicating devices for correct operation.
    l. Verify that filters are in place and vents are clear.
    m. Inspect control power transformers as follows:

1) Inspect for physical damage, cracked insulation, broken leads, connection tightness, defective wiring, and overall general condition.
2) Verify that primary- and secondary-fuse or circuit-breaker ratings match Drawings and comply with manufacturer's recommendations.
3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

2. Electrical Tests:

a. Perform dc voltage insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute. If the temperature of the bus is other than plus or minus 20 deg C, adjust the resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.
2) Do not proceed to the dielectric-withstand-voltage tests until insulation-resistance levels are raised above minimum values.

b. Perform a dielectric-withstand-voltage test on each bus section, each phase-to-ground with phases not under test grounded, according to manufacturer's published data. If manufacturer has no recommendation for this test, it shall be conducted according to NETA ATS, Table 100.2. Apply the test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric-withstand-voltage test, the test specimen is considered to have passed the test.

c. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid-state components or control devices that cannot tolerate the applied voltage, follow the manufacturer's recommendation.

1) Minimum insulation-resistance values of control wiring shall not be less than 2 megohms.

d. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at all devices.
2) Verify secondary voltages by energizing the primary winding with system voltage.

e. Perform current-injection tests on the entire current circuit in each section of switchgear.

1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.
2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.

f. Verify operation of space heaters.
g. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

G. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Verify correct connection of transformers with system requirements.
c. Verify that adequate clearances exist between primary and secondary circuit wiring.
d. Verify the unit is clean.
e. Verify that required grounding and shorting connections provide contact.
f. Verify correct operation of transformer withdrawal mechanism and grounding operation.
g. Verify correct primary- and secondary-fuse sizes for voltage transformers.
h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

a. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000-V dc for one minute. For units with solid-state components that cannot tolerate the applied voltage, comply with manufacturer's recommendations. Insulation-resistance values of instrument transformers shall not be less than values shown in NETA ATS, Table 100.5.
b. Perform a polarity test of each current transformer according to IEEE C57.13.1. Polarity results shall agree with transformer markings.
c. Perform a ratio-verification test using the voltage or current method according to IEEE C57.13.1. Ratio errors shall comply with IEEE C57.13.
d. Perform an excitation test on transformers used for relaying applications according to IEEE C57.13.1. Excitation results shall match the curve supplied by the manufacturer or shall comply with IEEE C57.13.1.
e. Measure current circuit burdens at transformer terminals according to IEEE C57.13.1. The measured burdens shall match the instrument transformer Accuracy Class rating.
f. Perform insulation-resistance tests on the primary winding with the secondary grounded. Test voltages shall comply with NETA ATS, Table 100.5. The insulation-resistance value shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5.
g. Perform dielectric-withstand-voltage tests on the primary winding with the secondary grounded. Test voltages shall comply with NETA ATS, Table 100.9. If

no evidence of distress or insulation failure is observed by the end of the total time of voltage application, the primary winding is considered to have passed the test.

h. Perform power-factor or dissipation-factor tests according to test equipment manufacturer's published data. Power-factor or dissipation-factor values shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with test equipment manufacturer's published data.

i. Verify that current-transformer secondary circuits are grounded and have only one grounding point according to IEEE C57.13.3.

3. Electrical Tests of Voltage and Potential Transformers:

a. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply the test voltage for one minute according to NETA ATS, Table 100.5. For units with solid-state components that cannot tolerate the applied voltage, follow manufacturer's recommendations. Insulation-resistance values of instrument transformers shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5.

b. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Test voltages shall be applied for one minute according to NETA ATS, Table 100.5. Insulation-resistance values of the transformers shall not be less than values shown in NETA ATS, Table 100.5.

c. Perform a polarity test on each transformer to verify the polarity marks or H(1)-X(1) relationship. Polarity results shall agree with transformer markings.

d. Perform a turns-ratio test on all tap positions. Ratio errors shall not exceed the tolerances specified in IEEE C57.13.

e. Measure voltage circuit burdens at transformer terminals. Measured burdens shall be compared to instrument transformer ratings. The measured burdens shall match the instrument transformer Accuracy Class rating.

f. Perform a dielectric-withstand-voltage test on the primary windings with the secondary windings connected to ground. The dielectric voltage shall comply with NETA ATS, Table 100.9. The test voltage shall be applied for one minute. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric-withstand-voltage test, the primary windings are considered to have passed the test.

g. Perform power-factor or dissipation-factor tests according to test equipment manufacturer's published data. Power-factor or dissipation-factor values shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with test equipment manufacturer's published data.

h. Verify that voltage-transformer secondary circuits are grounded and have only one grounding point according to IEEE C57.13.3.

H. Dry-Type Transformer Section Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, and grounding.

c. Verify that resilient mounts are free and that any shipping brackets have been removed.

d. Verify the unit is clean.

e. Verify that alarm, control, and trip settings on temperature and level indicators are set and operate within manufacturer's recommended settings.
f. Verify that cooling fans operate and that fan motors have correct overcurrent protection.
g. Perform specific inspections and mechanical tests recommended by the manufacturer.
h. Verify that as-left tap connections are as specified.
i. Verify the presence of surge arresters and that their ratings are as specified.

2. Electrical Tests:

a. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index; the value of the index shall not be less than 1.0.
b. Perform power-factor or dissipation-factor tests on windings according to the test equipment manufacturer's published data. Investigate and correct power-factor values that exceed:

1) 2.0 percent for power transformers.
2) 5.0 percent for distribution transformers.

c. Measure core insulation resistance at 500-V dc if the core is insulated and the core ground strap is removable. Core insulation-resistance values shall not be less than 1 megohm at 500-V dc.
d. Perform a power-factor or dissipation-factor tip-up test on windings greater than 2.5 kV. Tip-up test result exceeding 1.0 percent shall be investigated.
e. Perform turns-ratio tests at all tap positions. The test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio. If the test fails, replace the transformer.
f. Perform an excitation-current test on each phase. The typical excitation-current test data pattern for a three-legged core transformer is two similar current readings and one lower current reading. Investigate and correct if the test shows a different pattern.
g. Measure the resistance of each winding at each tap connection.
h. Perform an applied-voltage test on all high- and low-voltage windings-to-ground. See IEEE C57.12.91, Sections 10.2 and 10.9. The ac dielectric-withstand-voltage test result shall not exceed 75 percent of factory test voltage for one-minute duration. The dc dielectric-withstand-voltage test result shall not exceed 100 percent of the ac rms test voltage specified in IEEE C57.12.91, Section 10.2, for one-minute duration. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric-withstand-voltage test, the test specimen is considered to have passed the test.
i. Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.

I. Low-Voltage Power Circuit-Breaker Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.

b. Inspect anchorage, alignment, and grounding.
c. Verify that all maintenance devices are available for servicing and operating the breaker.
d. Verify the unit is clean.
e. Verify that the arc chutes are intact.
f. Inspect moving and stationary contacts for condition and alignment.
g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of the breaker are correct.
h. Perform mechanical operator and contact alignment tests on both the breaker and its operating mechanism according to manufacturer's published data.
i. Verify cell fit and element alignment.
j. Verify racking mechanism operation.
k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
l. Perform adjustments for final protective-device settings according to coordination study provided by end user.
m. Record as-found and as-left operation counter readings.

2. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to ground with switch closed, and across each open pole. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations shall be investigated.
b. Measure contact resistance across each power contact of the circuit breaker. Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
c. Determine long-time pickup and delay by primary current injection. Long-time pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are not available, trip times shall not exceed the value shown in NETA ATS, Table 100.7.
d. Determine short-time pickup and delay by primary current injection. Short-time pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current tolerance band.
e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current tolerance band.
f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.8.
g. Test functions of the trip unit by means of secondary injection. Pickup values and trip characteristic shall be as specified and within manufacturer's published tolerances.

h. Perform minimum pickup voltage tests on shunt trip and close coils according to manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall conform to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.20.
i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
j. Verify correct operation of any auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, anti-pump function, and trip unit battery condition. Reset trip logs and indicators. Auxiliary features shall operate according to manufacturer's published data.
k. Verify operation of charging mechanism. The charging mechanism shall operate according to manufacturer's published data.

J. Metering Device Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.
c. Verify the unit is clean.
d. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Verify accuracy of meters at cardinal points. Meter accuracy shall be according to manufacturer's published data.
b. Calibrate meters according to manufacturer's published data. Calibration results shall be within manufacturer's published tolerances.
c. Verify instrument multipliers. Instrument multipliers shall be according to system design specifications.
d. Verify that current-transformer and voltage-transformer secondary circuits are intact. Test results shall confirm the integrity of the secondary circuits of current and voltage transformers.

3.7 FOLLOW-UP SERVICE

A. Voltage Monitoring and Adjusting: After Substantial Completion, if requested by Owner, but not more than six months after Final Acceptance, perform the following voltage monitoring:

1. During a period of normal load cycles as evaluated by Owner, perform seven days of three-phase voltage recording at the outgoing section of each secondary unit substation. Use voltmeters with calibration traceable to National Institute of Science and Technology standards and with a chart speed of not less than 1 inch (25 mm) per hour. Voltage unbalance greater than 1 percent between phases, or deviation of any phase voltage from the nominal value by more than plus or minus 5 percent during the test period, is unacceptable.
2. Corrective Action: If test results are unacceptable, perform the following corrective action, as appropriate:

a. Adjust transformer taps.
b. Rebalance loads.
c. Prepare written request for voltage adjustment by electric utility.

3. Retests: Repeat monitoring, after corrective action has been performed, until satisfactory results are obtained.
4. Report:

a. Prepare a written report covering monitoring performed and corrective action taken.
b. For each relay and adjustable circuit breaker, tag the device with adjusting technician's initials and the date of the adjustment. Record the settings and file with test records specified in "Field Quality Control" Article.

B. Infrared Inspection: Perform the survey during periods of maximum possible loading. Remove all necessary covers prior to the inspection.

1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of the electrical power connections of the unit substation.
2. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchgear 11 months after date of Substantial Completion.
3. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1 de C at 30 deg C.
4. Record of Infrared Inspection: Prepare a certified report that identifies the testing technician and equipment used, and lists the following results:

a. Description of equipment to be tested.
b. Discrepancies.
c. Temperature difference between the area of concern and the reference area.
d. Probable cause of temperature difference.
e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
f. Identify load conditions at time of inspection.
g. Provide photographs and thermograms of the deficient area.

5. Act on inspection results according to the recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Owner's operations permit. Retest until deficiencies are corrected.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain systems.

END OF SECTION 261116.11

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 262200 - LOW-VOLTAGE TRANSFORME

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C
Conditions and Division 01 Specification Sect

1.2 SUMMARY

1.3 This Section includes dry-type distribution transformers rated 600 V and less, with capacities up to 1000 kVA

1.4 ACTION SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

B. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Qualification Data: For testing agency.

D. Source quality-control test reports.

E. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

B. Manufacturer shall provide copies of following documents to owner for review and evaluation:
   1. Product data and spare parts list;

1.7 QUALITY ASSURANCE

A. Testing Qualifications: Engage manufacturer with the experience and capability to conduct the testing to NETA standards.

B. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.9 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Acme Electric Corporation.
   2. Challenger Electrical Equipment Corp.
   3. Controlled Power Company.
   4. Eaton Electrical Sector; Eaton Corporation; Cutler-Hammer Products.
   5. Federal Pacific Transformer Company.
   6. General Electric Company.
   7. Hammond Co.

8. Magnetek Power Electronics Group.
9. Micron Industries Corp.
10. Myers Power Products, Inc.
11. Siemens Energy & Automation, Inc.
12. Sola/Hevi-Duty.
13. Square D Co./Schneider Electric.
14. Or approved equal

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper, unless otherwise specified.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Indoor Transformer Enclosure: Ventilated, NEMA 250, Type 2.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

D. Outdoor Transformer Enclosure: Totally enclosed, nonventilated, NEMA 250, Type 4X, stainless steel

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: ANSI 61 gray.

F. Taps for Transformers Smaller Than 3 kVA: One 5 percent tap above normal full capacity.

G. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

H. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

I. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

J. Energy Efficiency for Transformers Rated 15 kVA and Larger:

1. Complying with NEMA TP 1, Class 1 efficiency levels.
2. Tested according to NEMA TP 2.

K. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
2. Indicate value of K-factor on transformer nameplate.

L. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
2. Include special terminal for grounding the shield.
3. Shield Effectiveness:

a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
b. Common-Mode Noise Attenuation: Minimum of minus 120 dBA at 0.5 to 1.5 kHz; minimum of minus 65 dBA at 1.5 to 100 kHz.
c. Normal-Mode Noise Attenuation: Minimum of minus 52 dBA at 1.5 to 10 kHz.

M. For wall mounted transformers, wall Brackets: Manufacturer's standard brackets.

N. For tropical or sub tropic environments, provide fungus proofing, permanent fungicidal treatment for coil and core.

O. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

P. Low-Sound-Level Requirements: Maximum sound levels, when factory tested according to IEEE C57.12.91, as follows:

1. 9 kVA and Less: <40 dBA
2. 30 to 50 kVA: <45 dBA
3. 51 to 150 kVA: <50 dBA
4. 151 to 300 kVA: <55 dBA
5. 301 to 500 kVA: <60 dBA
6. 501 to 750 kVA: <62 dBA
7. 751 to 1000 kVA: <64 dBA

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met..

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions**.**

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.

1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
2. Perform 2 follow-up infrared scans of transformers, one at 4 months and the other at 11 months after Substantial Completion.
3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

C. Adjust all access doors and operating handles for free mechanical operation as described in manufacturer's instructions.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

B. Repaint scratched or marred exterior surfaces to match original finish.

END OF SECTION 262200

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C
Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. SPD: Surge Protection Device

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
6. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing indicating the connected load for each breaker in accordance with the NEC. Schedule to be typed and dated.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Provide spare breakers as shown in the schedules on the drawings
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
5.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with the manufacturer's recommendations.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Engineer and Owner no fewer than 10 working days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Engineer and Owner's written permission.
3. Comply with NFPA 70E.

1.11 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: See Plan Sheet Panel Schedule for Enclosure Types and Mounting.

1. Provide rated enclosures as shown below unless otherwise indicated on plans:

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

b. Indoor Damp or Wet Locations: NEMA 250, Type 3R.
c. Indoor Corrosive Locations: NEMA 250, Type 4X Fiberglass
d. Outdoor Locations: NEMA 250, Type 3R
e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
f. For conditions not addressed above, provide rated enclosures for environmental conditions at installed locations.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
6. Finishes:

a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel unless indicated otherwise on panel schedule.
c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components. (Only required with the relative humidity is above 90% and the electrical room or space is not conditioned.)

7. Directory Card: Inside panelboard door, mounted in transparent card holder. All breaker text to be typed and dated. Directory card shall include the source of supply to the panelboard

B. Incoming Mains Location: Top or bottom per contractors installation method unless specifically indicated on the drawings.

C. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
4. Neutral Bus: 100% of the phase bus capacity unless otherwise indicated.
5. Extra-Capacity Neutral Bus (when shown on the drawings): Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
6. Split Bus: Vertical buses divided into individual vertical sections.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
5. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.3 DISTRIBUTION PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or Approved Equal.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Mains: As shown on the drawings

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

G. Branch Overcurrent Protective Devices: Fused switches.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or approved equal.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains as shown on the drawings

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Provide Door-in-Door Construction with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

F. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

5. Or Approved Equal.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I squared x t response.

3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
4. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
5. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted or Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Communication Capability: as shown on the controls drawings when specifically indicated.
    f. Shunt Trip: as shown on the drawings.
    g. Undervoltage Trip: as shown on the drawings.
    h. Auxiliary Contacts: Where shown on the drawings, two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
    i. Alarm Switch: Where shown on the drawings, single-pole, normally open contact that actuates only when circuit breaker trips.
    j. Key Interlock Kit: Where shown on the drawings, externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
    k. Zone-Selective Interlocking: Where shown on the drawings, integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.

l. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
m. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off] position.
n. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.6 ACCESSORY COMPONENTS AND FEATURES (if call for on the contract drawings)

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Equipment Mounting:

C. Floor Mounted panelboards on concrete bases, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete in the project specifications. If no concrete is specified use 3000 psi.
a. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
b. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
c. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
d. Install anchor bolts to elevations required for proper attachment to panelboards.

e. Attach panelboard to the vertical finished or structural surface behind the panelboard.

2. Wall/Rack Mounted:
   a. Mount to wall/rack using unistrut with bolts/mounting hardware approved by the structural engineer or architect.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

E. Mount panelboards such that the highest operator is less than 78” above finished floor.

F. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

G. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

H. Install filler plates in unused spaces.

I. Stub a minimum of four 1-inch (27-GRC) empty conduits but not less than 25% of the combined cross sectional area of the all other live conduit from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub a minimum of four 1-inch (27-GRC) empty conduits but not less than 25% of the combined cross sectional area of the all other live conduit into raised floor space or below slab not on grade. This is for recessed panelboards only.

J. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

K. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Panelboards will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in the "Overcurrent Protective Device Coordination Study."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

END OF SECTION 262416

A1349-00 INTERIOR CONSTRUCTION, RENOVATI

SECTION 262500 GENERATOR DOCKING STATIO

PART 1 - GENERAL

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

1.1 DESCRIPTION OF WORK

A. Work Included: This Section specifies pad mo the packaged diesel engine generator system requirements.

B. Related Work: Refer to Section
1. Section 260500 – Basic Electrical Requirements
2. Section 263600 – Transfer Switches
3. Section 260526 – Grounding and Bonding

C. Generator docking system to provides ability to connect a portable generator to the docking station in the event on a single source failure while the permanent generator is unavailable for maintenance or other reasons for not operating. This complies with the requirements of NEC 700.3. Transfer of power from Normal source to Emergency source shall be via a docking station transfer switch, which will comply with NEC 700.12.

D. The docking station shall house two (2) separate circuit breakers for the station's Life Safety and Legally required loads, a fully rated transfer switch with tap box or Cam-Lok receptacle connection for temporary generator connection. These circuit breakers shall be rated for the load and shall be generator type circuit breaker with a collector bus feeding the breakers.

E. The docking station shall clearly provide a phase rotation indication to prevent incorrect phasing during temporary connection.

1.2 SUBMITTALS

A. Shop Drawings. Submit shop drawings including:

1. One-Line or Single line diagrams;
2. Physical arrangement drawings;
3. Unit wiring diagrams;
4. Drawings showing space available for conduit entrance and for routing and training of cables;
5. Schematic diagrams for electrically operated equipment; and
6. Catalog cuts of standard catalog items.

B. Working Drawings. Submit working drawings including:

1. Setting diagrams if anchoring in concrete is required;

2. Erection diagrams if shipped in sections or if parts are shipped separately and not installed at factory; and
3. Interconnection diagrams for circuits have externally located Instruments, controls, alarms or similar devices.

C. Test Reports. Submit certified test reports for all tests at the manufacturer's plant and all field tests.

1.3 REFERENCES

A. Emergency Service: Manufacturer maintains a service center capable of providing emergency maintenance and repairs at project site with an 8-hour maximum response time.

B. Listing and Labeling: Provide transfer switches specified in this section that are listed and labeled for emergency service under UL 1008.

1. The terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized
3. Testing laboratory" as defined in OSHA Regulation 1910.7.

C. Comply with NFPA 70

D. Comply with NFPA 110

E. Comply with NEMA ICS 1.

F. UL Compliance: comply with UL 1008, "Automatic Transfer Switches," and UL-508A”Control Panels” unless requirements of these specifications are stricter.

1.4 QUALITY ASSURANCE

A. Perform the following tests at the manufacturer's plant, in addition to the manufacturer's standard tests, on the assembled switchboards:

1. 60 Hz dielectric tests;
2. Mechanical operations tests;
3. Grounding of instrument;
4. Electrical operations tests; and
5. Control wiring checks.
6. Bus connection torque checks

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Ship equipment in assembled sections of maximum size as defined for each docking station by the Engineer.

B. Temporary Bracing. Brace and package the equipment to permit hoisting, lowering, and skidding into position. Clearly label any temporary internal bracing of equipment as TEMPORARY BRACING: TO BE REMOVED BEFORE OPERATION.

C. Protection Against Concealed Damage. Package equipment which may be subject to non-visible damage during shipment, with mechanical impact recorders which will register the maximum acceleration to which the equipment has been subjected along each axis. Unpack such equipment in the presence of the Engineer.

1.6 SUBMITTALS

A. Submit shop drawings for review showing fabricated work being furnished and installed under these Specifications. Submit such drawings prior to fabrication and within ample time to prevent delays in the work.
   1. Include plans and elevations for generator docking station indicated, include English dimensioned elevations, sections, weights and manufactures' technical data on features, performance, electrical characteristics, ratings, accessories, enclosure types and finishes.
   2. Include wiring diagrams for power, signal and control wiring along with any external SCADA interface.
   3. Include all factory instruction manuals.

B. Submit verified test results to the Engineer promptly upon completion of test.
   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   2. Include time-current characteristic curves for generator protective device.

C. Before installation of the wire and cable, submit the following information for each type and size of wire and cable for review:

   1. Manufacturer of the wire and cable.
   2. Number and size of strands composing each conductor.
   3. Conductor insulation composition and thickness in mils.
   4. Average overall diameter of finished wire and cable.
   5. Minimum insulation resistance in megohms per 1000 feet at 20˚C ambient.
   6. Jacket composition (if any) and thickness in mils.
   7. Total number of conductors per cable.
   8. Shield material (if any) and thickness.
   9. Conductor resistance and reactance in ohms per 1000 feet at 20˚C ambient.
   10. Conductor ampacity at 20˚C ambient.

D. Manufacturer shall coordinate with the generator manufacturer and contractor to ensure full compatibility with interfacing of equipment. This shall also include the multiple downstream Automatic Transfer Switches (ATS).

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer and testing agency is required.

B. Source Quality-Control Reports: Including, but not limited to, the following:

C. Field quality-control reports.

1. Test procedure used
2. Test results that comply with requirements
3. Results of failed tests and corrective actions taken to achieve test results that comply with the requirements.

D. Warranty: Five (5) year warranty on all components.

1.8 CLOSEOUT SUBMITTALS

1. Operation and Maintenance Data: For pad mount enclosure and electrical equipment, operation, and maintenance manuals.

2. In addition to items specified in Section 260500 "Basic Electrical Requirements," include the following:

   a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
   b. Operating instructions laminated and mounted adjacent to generator location.
   c. Training plan.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.

2. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
3. Tools: Each tool listed by part number in operations and maintenance manual.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Accept packaged engine generator set and accessories on site and verify any damage.

B. Protect equipment from dirt and moisture by securely wrapping in heavy plastic as required.

1.11 QUALITY ASSURANCE

A. Installer & Tester Qualifications: An authorized representative who is trained and approved by manufacturer, NETA or an NRTL certified company.

B. Testing Agency Qualifications: Accredited by Manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. UL (Underwriters Laboratories, Inc.) Standards

E. Comply with NFPA 70

1.12 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace all components (no exclusions – including batteries) of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Commissioning.
2. No owner deductibles or registration fees shall be allowed
3. All costs for supply and installation of a temporary equipment and cables shall be covered for any warranty repair that exceeds 48 hours
4. No surcharges for travel, milage or premium time shall be allowed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Trystar
B. Thomson Power Systems
C. ESL Power Systems
D. Approved equal or generator manufacturer provided
E. Source Limitations: Docking Station shall be manufactured in the U.S.

2.2 REQUIREMENTS

A. Enclosure:

1. Padmount, cabinet for the 400A docking station.
    a. Outdoor location NEMA 3R rated, rain-tight enclosure
    b. 3 point latching handle for front door (padlock provision or penta bolt)
    c. Hinged front and rear doors
    d. Gasketed enclosure
    e. Munsie green enclosure
2. Bottom access for conduit and cabling terminations
3. Front and rear access for maintenance
4. Anti-condensation heaters as necessary with thermostat. Self powered via bus connection or control power transformer provided by manufacturer.

B. Electrical Bussing

1. Silver-plated copper bus rated 400A or higher to meet generator output
2. 100% rated equipment ground bus
3. 100% rated neutral
4. 480Y/277V rated bus
5. Rated 42kAIC SCCR bracing of bus
6. Molded case generator circuit breakers of equivalent ratings and sized per single-line diagram, UL-489 certified.
7. Transfer switch
8. Lugs provided for all cable terminations and sizes shown

C. Transfer Switch

1. Integrated Automatic Transfer Switch (ATS)
    a. 2 source position – Perm Generator – Temp Generator (Perm to permanent mount generator while Temp connection will be to temporary generator.)

D. Phase monitoring indication

1. Factory installed phase monitoring/rotation indication

E. Kirk key interlock

1. Shall be a mechanical or kirk-key type interlock between the permanent generator and the temporary generator connection via the automatic transfer switch.

F. Temporary generator connection

1. Rated for 400A to comply with generator bus requirements
2. Tap connections for portable.

G. General Power requirements

1. Provision of a self-powered GFCI duplex receptacle for equipment service.

H. Environmental Conditions: Equipment shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 5°F to 104°F.
2. Relative Humidity: Zero to 95%.
3. Altitude: Sea level to 1000 feet.

I. Unusual Service Conditions: Equipment and installation are required to operate under the following conditions:

1. High salt-dust content in the air due to sea-spray evaporation – proximity to Harbor. (N/A)
2. Poor air quality environment due to proximity of Railyard & local industry

PART 3 - PRODUCTS

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.
B. Examine electrical connections. Verify actual locations of connections before enclosure installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify MBTA Electrical Maintenance and Resident Engineer no fewer than 7 working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without MBTA Electrical Maintenance Department and Resident Engineer written permission.

3.3 INSTALLATION

A. Comply with NECA 1 and NECA 404.

B. Comply with UL 1008, 891, 508, 508A, 486

C. Equipment Mounting:

1. Install generator docking station on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Coordinate size and location of concrete bases for Docking station mounted on grade. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

D. Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.
E. Install any ship loose items with the enclosure that require field installation.

3.4 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding."

B. Connect wiring according to Section 260519 “Low-Voltage Electrical Power Conductors and Cables."

3.5 IDENTIFICATION

A. Identify system components according to Section 260553 "Identification for Electrical Systems."

B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

C. Warning labels shall be affixed to the equipment to warn of potential of automatic starting of the generator

3.6 FIELD QUALITY CONTROL

A. Testing Agency:

1. Contractor will engage a Manufacturer Factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
2. Tests and inspections shall be performed by Manufacturer Factory service technician.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in International Electrical Testing Association (NETA) Acceptance Testing Specification (ATS) and Maintenance Testing Specification (MTS) and Manufacturer Specification as applies. Certify compliance with test parameters.

    a. Visual and Mechanical Inspection:

        1. Compare equipment nameplate data with Drawings and the Specifications.
        2. Inspect physical and mechanical condition.
        3. Inspect anchorage, alignment, and grounding.
        4. Verify that the unit is clean.

    b. Electrical and Mechanical Tests:

        1. Test relay & overcurrent protection devices.
        2. Verify phase rotation, phasing, and synchronized operation as required by the application.
        3. Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
        4. Verify correct functioning of the governor and regulator.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.

a. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
b. Verify that measurements are within manufacturer's specifications.

3. Coordinate tests with tests for transfer switches and run them concurrently.

4. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

5. Operational Test: After electrical circuitry has been energized, start generator units to confirm proper coordination and connection of equipment to operate as prescribed in the construction documentation.

6. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

7. Remove and replace malfunctioning units and re-inspect as specified above.

8. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

9. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

10. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's authorized service representative. Coordinate with quarterly generator preventive maintenance. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Parts shall be manufacturer's authorized replacement parts and supplies.

END OF SECTION 262500

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C
Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Isolated-ground receptacles.
3. Weather-resistant receptacles.
4. Snap switches.
5. Wall-switch and occupancy sensors.
6. Communications outlets.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. RFI: Radio-frequency interference.

C. TVSS: Transient voltage surge suppressor.

D. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).
5. Or Approved Equal.

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A.

2.5 TVSS RECEPTACLES

A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 1449, and FS W-C-596, with integral TVSS in line to ground, line to neutral, and neutral to ground.

1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

B. Duplex TVSS Convenience Receptacles:
1. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.

C. Isolated-Ground, Duplex Convenience Receptacles:
1. Description:

a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.6 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

1) Single Pole:

a. Cooper; AH1221.
b. Hubbell; HBL1221.
c. Leviton; 1221-2.
d. Pass & Seymour; CSB20AC1.
e. Or Approved Equal

2) Two Pole:

a. Cooper; AH1222.
b. Hubbell; HBL1222.
c. Leviton; 1222-2.
d. Pass & Seymour; CSB20AC2.
e. Or Approved Equal

3) Three Way:

a. Cooper; AH1223.
b. Hubbell; HBL1223.
c. Leviton; 1223-2.
d. Pass & Seymour; CSB20AC3.
e. Or Approved Equal

4) Four Way:

a. Cooper; AH1224.
b. Hubbell; HBL1224.
c. Leviton; 1224-2.
d. Pass & Seymour; CSB20AC4.
e. Or Approved Equal

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; AH1221PL for 120 and 277 V.
b. Hubbell; HBL1201PL for 120 and 277 V.
c. Leviton; 1221-LH1.
d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V. Or Approved Equal

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Toggle Switches, Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 7621 (single pole), 7623 (three way).
b. Hubbell; DS115 (single pole), DS315 (three way).
c. Leviton; 5621-2 (single pole), 5623-2 (three way).
d. Pass & Seymour; 2621 (single pole), 2623 (three way).
e. Or Approved Equal.

E. Lighted Toggle Switches, Square Face, 120 V, 15 A: Comply with NEMA WD 1 and UL 20.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 7631 (single pole), 7633 (three way).
b. Hubbell; DS120IL (single pole), DS320 (three way).
c. Leviton; 5631-2 (single pole), 5633-2 (three way).
d. Pass & Seymour; 2625 (single pole), 2626 (three way).
e. Or Approved Equal.

2. Description: With neon-lighted handle, illuminated when switch is "off."

2.7 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic 0.035-inch- (1-mm-) thick.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, thermoplastic with lockable cover.

2.8 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. TVSS Devices: Blue.
4. Isolated-Ground Receptacles: Orange

B. Wall Plate Color: For plastic covers, match device color.

2.9 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bryant Electric.
2. Cooper Industries, Inc.
3. Hubbell Building Automation, Inc.
4. Leviton Manufacturing Co., Inc.
5. Lightolier Controls.
6. Lithonia Lighting; Acuity Brands Lighting, Inc.
7. Lutron Electronics Co., Inc.
8. NSi Industries LLC; TORK Products.

9. RAB Lighting.
10. Sensor Switch, Inc.
11. Square D.
12. Watt Stopper.
13. Or Approved Equal.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.

C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.

D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy .

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).

E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

2.10 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bryant Electric.
2. Cooper Industries, Inc.
3. Hubbell Building Automation, Inc.
4. Leviton Manufacturing Co., Inc.
5. Lightolier Controls.
6. Lithonia Lighting; Acuity Brands Lighting, Inc.
7. Lutron Electronics Co., Inc.
8. NSi Industries LLC; TORK Products.
9. RAB Lighting.
10. Sensor Switch, Inc.
11. Square D.
12. Watt Stopper.
13. Or Approved Equal.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor Tag WS1:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft. (84 sq. m)
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP, manual "on," automatic "off."
4. Voltage: Match the circuit voltage Dual voltage, 120 and 277 V.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

D. Wall-Switch Sensor Tag WS2:

1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
2. Sensing Technology: PIR.
3. Switch Type: SP, manual "on," automatic "off."
4. Voltage: Dual voltage, 120 and 277 V.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.11 COMMUNICATIONS OUTLETS

A. Telephone Outlet:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; 3560-6.
    b. Leviton; 40649.
    c. Hubbell.
    d. Or approved equal.

2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

B. Combination Data and Telephone Outlet:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; 3562.
    b. Leviton; 40595.

c. Hubbell
d. Or approved equal.

2. Description: Two Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e;.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Wiring device will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 262726

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 262816 - ENCLOSED SWITCHES AND CI

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C Conditions and other Division 01 Specificatio

1.2 SUMMARY

A. Section Includes:
   1. Nonfusible switches.
   2. Molded-case circuit breakers (MCCBs).
   3. Molded-case switches.
   4. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

   1. Enclosure types and details.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.9 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Engineer and Owner no fewer than two days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Engineer and Owner's written permission.
4. Comply with NFPA 70E.

1.11 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels in accordance with NFPA 70.

PART 2 - PRODUCTS

2.1 NONFUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawingsor comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. or approved equal

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Where shown on the drawings, two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.
5. Accessory Control Power Voltage: As shown on the drawings.

2.2 MOLDED-CASE CIRCUIT BREAKERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. ABB
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.
5. Square D; a brand of Schneider Electric.
6. or approved equal.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

G. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

I. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. hShunt Trip (When specifically shown on the on line diagram): Trip coil energized from separate circuit, with coil-clearing contact.
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
7. Auxiliary Contacts: (When shown on the drawings) two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
8. Alarm Switch: One NC contact that operates only when circuit breaker has tripped.
9. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
10. Zone-Selective Interlocking: Integral with electronicground-fault trip unit; for interlocking ground-fault protection function.
11. Electrical Operator: Provide remote control for on, off, and reset operations.
12. Accessory Control Power Voltage: Integrally mounted, self-poweredAs shown on the drawings.

2.3 MOLDED-CASE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. ABB
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Siemens Energy & Automation, Inc.
5. Square D; a brand of Schneider Electric.
6. or approved equal

B. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

C. Features and Accessories:

1. Standard frame sizes and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
4. Shunt Trip (When specifically shown on the drawings): Trip coil energized from separate circuit, with coil-clearing contact.
5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
6. Auxiliary Contacts: (When shown on the drawings) two SPDT switches with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
7. Alarm Switch: One NC contact (When shown on the drawings.) that operates only when switch has tripped.
8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
10. Electrical Operator: Provide remote control for on, off, and reset operations.
11. Accessory Control Power Voltage: Integrally mounted, self-powered as shown on the drawings.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R, unless specifically indicated otherwise on the drawings.
3. Indoor damp, wet, corrosive areas: NEMA 250, Type 3R
4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.

c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

END OF SECTION 262816

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 262933 - CONTROLLERS FOR FIRE-PUM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C
Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. Section Includes:

1. Full-service, full-voltage controllers rated 600 V and less.
2. Controllers for pressure-maintenance pumps.

1.3 DEFINITIONS

A. ATS: Automatic transfer switch(es).

B. ECM: Electronic control module.

C. MCCB: Molded-case circuit breaker.

D. NO: Normally open.

E. PID: Proportional integral derivative.

F. VFC: Variable-frequency controller(s)

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each type of product indicated.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Show tabulations of the following:

a. Each installed unit's type and details.
b. Enclosure types and details for types other than NEMA 250, Type 2.
c. Factory-installed devices.

d. Nameplate legends.
e. Short-circuit current (withstand) rating of integrated unit.
f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.
g. Specified modifications.

4. Include diagrams for power, signal, alarm, control wiring, and pressure-sensing tubing.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Certificates: For each type of product indicated, from manufacturer.

C. Source quality-control reports.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product indicated to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.
2. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor-based logic controls.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Indicating Lights: Two of each type and color of lens installed;
2. Auxiliary Contacts: One for each size and type of magnetic contactor installed.
3. Power Contacts: Three for each size and type of magnetic contactor installed.
4. Contactor Coils: One for each size and type of magnetic controller installed.
5. Relay Boards: One for each size and type of relay board installed.
6. Operator Interface: One microprocessor board(s), complete with display and membrane keypad.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of an NRTL.

B. Source Limitations: Obtain fire-pump controllers and all associated equipment from single source or producer.

1.9 FIELD CONDITIONS

A. Environmental Limitations:

1. Ambient Temperature Rating: Not less than 40 deg F and not exceeding 122 deg F unless otherwise indicated.
2. Altitude Rating: Not exceeding 6600 feet unless otherwise indicated.

B. Interruption of Existing Electric Service: Notify Owner no fewer than sevendays in advance of proposed interruption of electric service, and comply with NFPA 70E.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 20 and NFPA 70.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 FULL-SERVICE CONTROLLERS

A. Manufacturers:

1. Firetrol
2. Eaton
3. Hubbel
4. Or approved equal

B. General Requirements for Full-Service Controllers:

1. Comply with NFPA 20 and UL 218
2. Combined automatic and nonautomatic operation.
3. Factory assembled, wired, and tested; continuous-duty rated.

C. Method of Starting:

1. Magnetic Controller: Across-the-linetype.
2. Emergency Start: Mechanically operated start handle that closes and retains the motor RUN contactor independent of all electric or pressure actuators.

D. Method of Stopping: Automatic and nonautomatic shutdown after automatic startingShow controller short-circuit current (withstand) rating (or available short-circuit currents) on Drawings. Consider conductor size and distance from substation or supply transformers when calculating short-circuit currents at controllers.

E. Capacity: Rated for fire-pump-driver horsepower and short-circuit-current (withstand) rating equal to or greater than short-circuit current available at controller location.

F. Method of Isolation and Overcurrent Protection: Interlocked isolating switch and nonthermal MCCB; with a common, externally mounted operating handle, and providing locked-rotor protection.

G. Door-Mounted Operator Interface and Controls:

1. Monitor, display, and control the devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.
2. Method of Control and Indication:

    a. Microprocessor-based logiccontroller, with multiline digital readout.
    b. Membrane keypad.
    c. LEDalarm and status indicating lights.

3. LocalAlarm and Status Indications:

    a. Controller power on.
    b. Motor running condition.
    c. Loss-of-line power.
    d. Line-power phase reversal.
    e. Line-power single-phase condition.

4. Audible alarm, with silence push button.
5. Nonautomatic START and STOP push buttons or switches.

2.3 CONTROLLERS FOR PRESSURE-MAINTENANCE PUMPS

A. Manufacturers:

1. Firetrol
2. Eaton
3. Hubbel
4. Or approved equal

B.

C. General Requirements for Pressure-Maintenance-Pump Controllers:

1. Type: UL 508, factory-assembled, -wired, and -tested, across-the-line controller; for combined automatic and manual operation.
2. Enclosure: UL 508 and NEMA 250, Type 2 for wall-mounting.
3. Factory assembled, wired, and tested.
4. Finish: Manufacturer's standard color paint.

D. Rate controller for scheduled horsepower and include the following:

1. Fusible disconnect switch.

2. Pressure switch.
3. Hand-off-auto selector switch.
4. Pilot light.
5. Running period timer.

2.4 ENCLOSURES

A. Fire-Pump Controllers, ATS, Remote Alarm Panels, and Low-Suction-Shutdown Panels: NEMA 250, to comply with environmental conditions at installed locations and NFPA 20.

1. Indoor, Dry and Clean Locations: Type 1
2. Indoor Locations Subject to Dripping Noncorrosive Liquids: Type 2
3. Outdoor Locations: Type 3R
4. Other Wet or Damp, Indoor Locations: Type 4
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.

B. Enclosure Color: Manufacturer's standard "fire-pump-controller red"

C. Nameplates: Comply with NFPA 20; complete with capacity, characteristics, approvals, listings, and other pertinent data.

D. Optional Features:

1. Floor stands, 12 inches high, for floor-mounted controllers.
2. Space heater, [**120-V ac**] [**240-V ac**] [**, with humidistat**] [**, with thermostat**].
3. .
4.

2.5 SOURCE QUALITY CONTROL

A. Testing: Test and inspect fire-pump controllers according to requirements in NFPA 20 and UL 218.

1. Verification of Performance: Rate controllers according to operation of functions and features specified.

B. Fire-pump controllers will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive equipment, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine equipment before installation. Reject equipment that is wet or damaged by moisture or mold.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONTROLLER INSTALLATION

A. Coordinate installation of controllers with other construction including conduit, piping, fire-pump equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access doors and panels. Ensure that controllers are within sight of fire-pump drivers.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Install controllers within sight of their respective drivers.

D. Connect controllers to their dedicated pressure-sensing lines.

E. Wall-Mounting Controllers: Install controllers on walls with disconnect operating handles not higher than 79 inches above finished floor, and bottom of enclosure not less than 12 inches above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

F. Floor-Mounting Controllers: Install controllers on concrete base(s), using floor stands high enough so that the bottom of enclosure cabinet is not less than 12 inches above finished floor. Comply with requirements for concrete bases specified in Section 033000 "Cast-in-Place Concrete."

1. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
3. Install anchor bolts to elevations required for proper attachment to supported equipment.

G. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

H. Comply with NEMA ICS 15.

3.3 POWER WIRING INSTALLATION

A. Install power wiring between controllers and their services or sources, and between controllers and their drivers. Comply with requirements in NFPA 20, NFPA 70, and Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 CONTROL AND ALARM WIRING INSTALLATION

A. Install wiring between remote alarm panels and controllers. Comply with requirements in NFPA 20, NFPA 70, and Section 260523 "Control-Voltage Electrical Power Cables."

B. Install wiring between controllers and the building's fire-alarm system. Comply with requirements specified in Section 284621.11 " Addressable Fire-Alarm Systems."

C. Bundle, train, and support wiring in enclosures.

D. Connect remote manual and automatic activation devices where applicable.

3.5 IDENTIFICATION

A. Comply with requirements in NFPA 20 for marking fire-pump controllers.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification in NFPA 20 and as specified in Section 260553 "Identification for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

D. Acceptance Testing Preparation:

1. Inspect and Test Each Component:

    a. Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.
    b. Test insulation resistance for each element, component, connecting supply, feeder, and control circuits.
    c. Test continuity of each circuit.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Field Acceptance Tests:

1. Do not begin field acceptance testing until suction piping has been flushed and hydrostatically tested and the certificate for flushing and testing has been submitted to Architect and authorities having jurisdiction.

2. Prior to starting, notify authorities having jurisdiction of the time and place of the acceptance testing.
3. Engage manufacturer's factory-authorized service representative to be present during the testing.
4. Perform field acceptance tests as outlined in NFPA 20.

F. Controllers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to performstartup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

A. Adjust controllersto function smoothly and as recommended by manufacturer.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, and timers.

C. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

D. Set field-adjustable pressure switches.

3.9 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.10 DEMONSTRATION

A. **Engage a factory-authorized service representative to train** Owner's maintenance personnel to adjust, operate, and maintain controllersand to use and reprogram microprocessor-based controls within this equipment.

END OF SECTION 262933

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C
Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. It is the intent to purchase all Emergency Coordinated Components through a single source of supply to ensure proper communication and operation. All ATS's, Engine Generator, and Annunciation shall be sourced through Engine Generator Supplier.

B. Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.
2. Bypass/isolation switches.
3. Remote annunciation systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Source Limitations: Obtain automatic transfer switches, bypass/isolation switches, manual transfer switches, and remote annunciators, through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 110.

G. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.7 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Construction Manager and Owner no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Construction Manager and Owner's written permission.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Contactor Transfer Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Caterpillar; Engine Div.
   b. Emerson; ASCO Power Technologies, LP.
   c. GE Zenith Controls.
   d. Kohler Power Systems; Generator Division.
   e. Onan/Cummins Power Generation; Industrial Business Group.
   f. Russelectric, Inc.
   g. or Approved Equal.

B. Transfer Switches Using Molded-Case Switches or Circuit Breakers (When specifically shown on the drawings):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Eaton Electrical Inc.; Cutler-Hammer.
   b. GE Zenith Controls.
   c. Caterpillar; Engine Div.
   d. Emerson; ASCO Power Technologies, LP.
   e. Kohler Power Systems; Generator Division.
   f. Onan/Cummins Power Generation; Industrial Business Group.
   g. Russelectric, Inc
   h. or Approved Equal.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a non fused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

I. Oversize Neutral (when specifically shown on the one line diagram): Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

J. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater. (Heaters shall be powered from the load size of the switches. No external power sources shall be required. Fuses shall be provided per the NEC and UL.)

K. Battery Charger: For generator starting batteries. (to be provided when a battery charger is not specifically provided in the generator enclosures.)

1. Float type rated 2 A.
2. Ammeter to display charging current.
3. Fused ac inputs and dc outputs.

L. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

M. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

N. Enclosures:

1. Indoor NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.
2. Outdoor: NEMA 250, Type 4X Stainless Steel, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

D. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

E. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

F. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.

G. Automatic Closed-Transition Transfer Switches (When specifically call out on the one line diagram): Include the following functions and characteristics:

1. Fully automatic make-before-break operation.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.

    a. Initiation occurs without active control of generator.
    b. Controls ensure that closed-transition load transfer closure occurs only when the 2 sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.

4. Failure of power source serving load initiates automatic break-before-make transfer.

H. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

I. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
12. Dual Utility Source: Provide the ability to manually select the preferred utility source when the ATS is use to switch between two utilities.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4 BYPASS/ISOLATION SWITCHES (When specifically shown on the drawings)

A. Comply with requirements for Level 1 equipment according to NFPA 110.

B. Description: Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:

1. Means to lock bypass/isolation switch in the position that isolates transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. While isolated, interlocks prevent transfer-switch operation, except for testing or maintenance.
2. Drawout Arrangement for Transfer Switch: Provide physical separation from live parts and accessibility for testing and maintenance operations.
3. Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or greater than those of associated automatic transfer switch, and with same phase arrangement and number of poles.
4. Contact temperatures of bypass/isolation switches shall not exceed those of automatic transfer-switch contacts when they are carrying rated load.
5. Operability: Constructed so load bypass and transfer-switch isolation can be performed by 1 person in no more than 2 operations in 15 seconds or less.
6. Legend: Manufacturer's standard legend for control labels and instruction signs shall describe operating instructions.
7. Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.

C. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed copper bus bars; plated at connection points and braced for the indicated available short-circuit current.

2.5 REMOTE ANNUNCIATOR SYSTEM (When specifically shown on the drawings)

A. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches. Annunciation shall include the following:

1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Switch position.
3. Switch in test mode.
4. Failure of communication link.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.
2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
3. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.
4. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.6 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches nominal high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Section 260529 "Hangers and Supports for Electrical Systems."

B. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

C. Identify components according to Section 260553 "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Provide raceway to accommodate required wiring.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

F. Prepare test and inspection reports.

G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below.

B. Coordinate this training with that for generator equipment.

END OF SECTION 263600

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 264113 - LIGHTNING PROTECTION FOR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C
Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. Section includes lightning protection for structures and buildings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For air terminals and mounting accessories.

1. Layout of the lightning protection system, along with details of the components to be used in the installation.
2. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer. Include data on listing or certification by UL.

B. Provide a certification from the manufacturer of all roofing systems that the mounting method is approved by manufacturer of roofing material.

C. Field quality-control reports.

D. Comply with recommendations in NFPA 780, Annex D, "Inspection and Maintenance of Lightning Protection Systems," for maintenance of the lightning protection system.

E. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features, including the following:

1. Ground rods.
2. Ground loop conductor.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Certified by UL or LPI as a Master Installer/Designer, trained and approved for installation of units required for this Project.

B. System Certificate:

1. UL Master Label.
2. LPI System Certificate.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 780, "Definitions" Article.

1.6 COORDINATION

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

B. Coordinate installation of air terminals attached to roof systems with roofing manufacturer and Installer.

C. Flashings of through-roof assemblies shall comply with roofing manufacturers' specifications.

PART 2 - PRODUCTS

2.1 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96 and NFPA 780.

B. Roof-Mounted Air Terminals: NFPA 780, Class I or Class II depending on building height, copper unless otherwise indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, or comparable product by one of the following:

   a. East Coast Lightning Equipment Inc.
   b. ERICO International Corporation.
   c. Harger.
   d. Heary Bros. Lightning Protection Co. Inc.
   e. Independent Protection Co.
   f. Preferred Lightning Protection.
   g. Robbins Lightning, Inc.
   h. Thompson Lightning Protection, Inc.
   i. or Approved Equal

2. Air Terminals More than 24 Inches (600 mm) Long: With brace attached to the terminal at not less than half the height of the terminal.
3. Single-Membrane, Roof-Mounted Air Terminals: Designed specifically for single-membrane roof system materials. Comply with requirements in roofing Sections.

C. Main and Bonding Conductors: Copper.

D. Ground Loop Conductor: The same size and type as the main conductor except tinned.

E. Ground Rods: Copper-clad steel, sectional type; 3/4 inch (19 mm) in diameter by 10 feet (3 m) long.

F. Heavy-Duty, Stack-Mounted, Lightning Protection Components: Stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lightning protection components and systems according to UL 96A and NFPA 780

B. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends.

C. Conceal the following conductors:

1. System conductors.
2. Down conductors.
3. Interior conductors.
4. Conductors within normal view of exterior locations at grade within 200 feet (60 m) of building.

D. Cable Connections: Use crimped or bolted connections for all conductor splices and connections between conductors and other components. Use exothermic-welded connections in underground portions of the system.

E. Cable Connections: Use exothermic-welded connections for all conductor splices and connections between conductors and other components.

1. Exception: In single-ply membrane roofing, exothermic-welded connections may be used only below the roof level.

F. Air Terminals on Single-Ply Membrane Roofing: Comply with roofing membrane and adhesive manufacturer's written instructions.

G. Bond extremities of vertical metal bodies exceeding 60 feet (18 m) in length to lightning protection components.

H. Ground Loop: Install ground-level, potential equalization conductor and extend around the perimeter of structure.

1. Bury ground ring not less than 24 inches (600 mm) from building foundation.
2. Bond ground terminals to the ground loop.
3. Bond grounded building systems to the ground loop conductor within 12 feet (3.6 m) of grade level.

I. Bond lightning protection components with intermediate-level interconnection loop conductors to grounded metal bodies of building at 60-foot (18-m) intervals.

J. Install a bond jumper between the building ground and the lightning protection Ground Loop. The bond jumper shall be a 4/0.

3.2 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.3 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

A. Notify Architect at least 48 hours in advance of inspection before concealing lightning protection components.

B. Obtain one of the following labels:

1. UL Inspection: Meet requirements to obtain a UL Master Label for system.
2. LPI System Inspection: Meet requirements to obtain an LPI System Certificate.

END OF SECTION 264113

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the C
Conditions and Division 01 Specification Sect

1.2 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Exit signs.
3. Lighting fixture supports.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type.

a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

D. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.

1. Include Samples of luminaires and accessories involving color and finish selection.

E. Samples for Verification: For each type of luminaire.

1. Include Samples of luminaires and accessories to verify finish selection.

F. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches (300 mm) of the plane of the luminaires.
4. Structural members to which luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:

a. Other luminaires.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Ceiling-mounted projectors.
g. Cameras.

7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For each type of luminaire.

E. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

F. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all luminaire types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.
   1. Eaton Lighting;
   2. Lithonia Lighting, Acuity Brands Lighting Inc;
   3. Phillips Lighting;
   4. Day-Bright;
   5. Or approved equal

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Recessed Fixtures: Comply with NEMA LE 4.

E. Bulb shape complying with ANSI C79.1.

F. Lamp base complying with ANSI C81.61.

G. CRI of 65. CCT of 2700 K.

H. Rated lamp life of 50,000 hours.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: mvolt, as indicated on schedule.

   1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

L. Housings:

1. Extruded-aluminum housing and heat sink.
2. White paint finish.

2.3 DOWNLIGHT

A. Minimum 1,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

B. Universal mounting bracket.

C. Integral junction box with conduit fittings.

2.4 RECESSED LINEAR

A. Minimum 1,500 lumens. Minimum allowable efficacy of 85 lumens per watt.

B. Integral junction box with conduit fittings.

2.5 STRIP LIGHT

A. Minimum 750 lumens. Minimum allowable efficacy of 75 lumens per watt.

B. Integral junction box with conduit fittings.

2.6 SURFACE MOUNT, (LINEAR, NONLINEAR)

A. Minimum 750 lumens. Minimum allowable efficacy of 75 lumens per watt.

B. Integral junction box with conduit fittings.

2.7 SUSPENDED, LINEAR

A. Minimum 1,500 lumens. Minimum allowable efficacy of 85 lumens per watt.

2.8 SUSPENDED, NONLINEAR

A. Minimum 1,500 lumens. Minimum allowable efficacy of 85 lumens per watt.

B. Integral junction box with conduit fittings.

2.9 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:
1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. White painted finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.10 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm)

D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

2.11 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
   2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

      a. Battery: Sealed, maintenance-free, nickel-cadmium type.
      b. Charger: Fully automatic, solid-state type with sealed transfer relay.
      c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
      d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
      e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
      f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
      g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch- (4-mm-) diameter aircraft cable supports.
2. Ceiling mount with hook mount.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 270526 - GROUNDING AND BONDING F

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Selection and installation of grounding
2. Selection and installation of communica
3. Selection and installation of communica

1.2 DEFINITIONS

A. BBC: Backbone bonding conductor, for connecting multiple TBBs serving the same floor.

B. PBB: Primary bonding busbar, located in main distribution frame room, ideally near electrical service entrance.

C. RBB: Rack bonding busbar, located in equipment cabinets and racks.

D. SBB: Secondary bonding busbar, located in intermediate distribution frame rooms.

E. TBB: Telecommunications bonding backbone, for connecting SBBs to PBB.

F. TBC: Telecommunications bonding conductor, for connecting PBB to intersystem bonding termination device or busbar at electrical service entrance.

G. TEBC: Telecommunications equipment bonding conductor, for connecting RBBs to SBBs or PBB.

H. UBC: Unit bonding conductor, for connecting individual communications equipment to RBBs or SBBs.

1.3 ACTION SUBMITTALS

A. Shop Drawings:
1. Grounding conductors.
2. Bonding conductors.
3. Communications Busbar.
4. Communications bonding conductor.
5. Include plans, elevations, sections, details, and attachments to other work.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions: Record copy of official installation instructions issued to Installer by manufacturer for the following:

1. Installing wire connector on conductor.
2. Recommended torque values.

1.5 CLOSEOUT SUBMITTALS

A. Record Documentation: Project record documents in accordance with Section 017839 "Project Record Documents" must include locations of PBB and SBBs, and routing of TBC, TBBs, and BBCs.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.

B. Inspect test results of grounding system measured at point of TBC connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of TBC only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF GROUNDING CONDUCTORS

A. Unless otherwise indicated in this Section or on Drawings, provide products specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Manufacturers: Subject to compliance with requirements:
1. Allied Tude & Conduit.
2. Harger Lightning & Grounding.
3. Panduit Corp.
4. TE Connectivity Ltd.
5. Substitutions: or approved equal

C. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V.
1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.

D. Bare Copper Conductors:
   1. Bonding Cable: 28 kcmils, 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
   2. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   3. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick

3.3 SELECTION OF COMMUNICATIONS BUSBARS

A. Unless otherwise indicated in this Section or on Drawings, provide products specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Manufacturers: Subject to compliance with requirements:
   1. Chatsworth products Inc.
   2. Harger Lightning & Grounding.
   3. Panduit Corp.
   4. or approved equal

C. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with J-STD-607-A. Predrilling shall be with holes for use with lugs specified in this document.
   1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
   2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
   3. Rack-Mounted Vertical Busbar: 72 or 36 inches stainless-steel or copper-plated hardware for attachment to the rack.

D. PBB:

   1. Dimensions: Refer to drawings
   2. Stand-Off Distance: Refer to drawings

E. SBB:

   1. Dimensions: Refer to drawings
   2. Stand-Off Distance: Refer to drawings

3.4 SELECTION OF COMMUNICATIONS BONDING CONDUCTORS

A. Unless otherwise indicated in this Section or on Drawings, provide products specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Manufacturers: Subject to compliance with requirements:
   1. Chatsworth Products, Inc.
   2. Harger Lightning & Grounding
   3. Hubbell Inc.

4. Panduit Corp.
5. TE Connectivity Ltd.
6. or approved equal

C. Communications Busbar Connections:

1. TBC: Not smaller than and no smaller than largest TBB.
2. TBB: Not smaller than 2 kcmil per linear ft of conductor length, but not larger than 750 kcmil, unless otherwise indicated on Drawings.
3. BBC: Not smaller than largest TBB to which it is connected unless otherwise indicated on Drawings.
4. TEBC: Not smaller than unless otherwise indicated on Drawings. Provide bolted connectors.
5. UBC: Not smaller than unless otherwise indicated on Drawings. Provide bolted connectors.
6. Bonding Conductors to Structural Steel: Not smaller than unless otherwise indicated on Drawings. Provide bolted clamp connectors.

D. Cable Tray Connections:

1. Cable Tray Equipment Grounding Conductor: .
2. Cable Tray Bonding Jumper: If not supplied by cable manufacturer, provide bonding jumper not smaller than and not longer than 12 inch. If jumper is wire, it must be terminated with lug having . If jumper is flexible braid, it must be terminated with . Attach with bonding screw or connector provided by cable tray manufacturer.

E. Underground Connections: Not smaller than . Provide welded connectors, except bolted connectors may be used in handholes or manholes and as otherwise indicated on Drawings.

3.5 INSTALLATION OF BONDING FOR COMMUNICATIONS

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Bonding of Communications: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with BICSI N3.
2. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Busbars:

a. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 12 inch above finished floor unless otherwise indicated.
b. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

2. Conductors:

a. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
b. Assemble wire connector to conductor, complying with manufacturer's published instructions and as follows:

1) Use crimping tool and die specific to connector.
2) Pretwist conductor.
3) Apply antioxidant compound to bolted and compression connections.

c. Install in straightest and shortest route between origination and termination point, and no longer than required. Bend radius must not be smaller than 10 times diameter of conductor. No single bend may exceed 90 degrees.
d. Install without splices.
e. Support conductors at not more than 36 inch intervals.
f. Outside telecommunications rooms, install conductors in metric designator 21 (trade size 3/4) PVC-80 conduit until conduit enters telecommunications room. Install bonding conductors in EMT-A or EMT-SS when routed through plenum. Do not install bonding conductors in EMT-S unless otherwise indicated on Drawings.

1) If bonding conductor must be installed in EMT-S or other ferrous metallic raceway, bond conductor to raceway using grounding bushing that complies with Section 270528 "Pathways for Communications Systems," and bond both ends of raceway to SBB.

3. Provide TBC and terminate ends to PBB and intersystem bonding at electrical service entrance in accordance with Section 250.94, "Bonding for Communication Systems," of NFPA 70.
4. Busbar Interconnections: Bond SBBs to PBB with TBBs. If more than one TBB is installed, bond TBBs together BBCs where required by TIA-607.
5. Structural Steel: Where structural steel of steel frame building is readily accessible within room or space, bond each SBB and PBB to vertical steel of building frame.
6. Communications Enclosures: Bond metallic enclosures of telecommunications equipment with UBCs to nearest SBB or PBB.
7. Equipment Racks: Bond metallic components of enclosures to RBB using UBCs. Provide RBB if not provided by enclosure or rack manufacturer. Bond RBB to SBB with TEBC. Power connection must comply with NFPA 70; equipment grounding conductor in power cord of cord- and plug-connected equipment must be considered supplemental to bonding requirements in this Section.
8. Shielded Cable: Bond shield of shielded cable to SBB in communications rooms and spaces. Comply with TIA-568.1 and TIA-568.2 when grounding shielded balanced twisted-pair cables.
9. Primary Protector: Bond to PBB with insulated bonding conductor.
10. Electrical Power Panelboards: Where electrical panelboards for communications equipment are located in same room or space, bond each ground bar of panelboard to SBB.
11. Cable Trays: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
12. Ladder Racks: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
13. Access Floors: Bond metal parts of access floors to SBB.

D. Special Techniques:

1. Ring Electrode: Buried at least 30 inch below grade and at least 24 inch from base of tower or mounting.
2. Bond each tower base and metallic frame of dish to ring electrode, buried at least 18 inch below grade.
3. Bond ring electrode and antenna bonding conductors to equipment room PBB or SBB, buried at least 30 inch below grade.
4. Bond metal fences located within 6 ft of towers and antennas to ring electrode, buried at least 18 inch below grade.
5. Special Requirements for Roof-Mounted Towers:

    a. Roof Ring: Meet requirements for ring electrode except conductors must comply with NFPA 780.
    b. Bond tower base footings steel, SBB in equipment room, and antenna support guys to roof ring.
    c. Connect roof ring to perimeter conductors of lightning protection system.

6. Special Requirements for Waveguides and Coaxial Cable:

    a. Bond cable shields at point of entry into building to nearest SBB and to cable entrance plate, using 2 AWG bonding conductors.
    b. Bond coaxial cable surge arrester to ring electrode or roof ring using bonding conductor size recommended by surge-arrester manufacturer.

3.6 IDENTIFICATION

A. Comply with Section 270553 "Identification for Communications Systems."

B. Labels must be preprinted or computer-printed type.

1. Label PBB(s) with "ts-PBB," where "ts" is telecommunications space identifier for location of PBB.
2. Label SBB(s) with "ts-SBB," where "ts" is telecommunications space identifier for location of SBB.
3. Label TBC, TBBs, and BBCs at attachment points with legend: "WARNING! COMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.7 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench according to manufacturer's published instructions.

2. Test bonding connections of system using AC earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing PBB or SBB, using process recommended by BICSI N1. Conduct tests with facility in operation.

    a. Measure resistance between PBB and electrical service intersystem termination point. Maximum acceptable value is 100 mΩ.

        1) If measured resistance from electrical service equipment to ground exceeds , notify Architect and include recommendations to reduce resistance to ground.

    b. Measure resistance between SBBs and PBB. Maximum acceptable value is 100 mΩ.

3. Test for ground loop currents using digital clamp-on ammeter, with full scale not more than 10 A, displaying current in increments of 0.01 A at accuracy of plus or minus 2.0 percent.

    a. With grounding infrastructure completed and communications system electronics operating, measure current in bonding conductors connected to PBB. Maximum acceptable AC current level is 1 A.

C. Nonconforming Work:

1. Communications bonding will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Collect, assemble, and submit test and inspection reports.

3.8 PROTECTION

A. After installation, protect busbars and conductors from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 270526

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 270529 - HANGERS AND SUPPORTS FOI

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems for comm
2. Conduit and cable support devices.
3. Support for conductors in vertical condu
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 270548 "Seismic Controls for Communications Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fabrication and installation details for communications hangers and support systems.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Trapeze hangers. Include product data, design calculations, and details for components.
b. Steel slotted-channel systems.
c. Aluminum slotted-channel systems.
d. Nonmetallic slotted-channel systems.
e. Equipment supports.
f. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
g. Include design calculations for seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Ductwork, piping, fittings, and supports.
3. Structural members to which hangers and supports will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

    a. Luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Projectors.
    g. Smoke detectors.
    h. Heat detectors.

B. Seismic Qualification Data: Certificates, for hangers and supports for communications equipment and systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified."
2. Component Importance Factor: .

C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ABB, Electrification Business.
    b. CADDY; brand of nVent Electrical plc.
    c. Cooper B-line; brand of Eaton, Electrical Sector.
    d. or approved equal

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: .
4. Channel Width: .
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
9. Channel Dimensions: Selected for applicable load criteria.

B. Conduit and Cable Support Devices: clamps, hangers, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored communications conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Hilti, Inc.
        2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) or approved equal

2. Mechanical-Expansion Anchors: Insert-wedge-type for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Cooper B-line; brand of Eaton, Electrical Sector.
        2) Empire Industries, Inc.
        3) Hilti, Inc.
        4) or approved equal

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M,Grade A325.
6. Toggle Bolts: springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.

2. NECA/BICSI 568.
3. TIA-569-D.
4. NECA 101.
5. NECA 102.
6. NECA 105.
7. NECA 111.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as **required by scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in** NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted **support** system, sized so capacity can be increased by at least percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with.

F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Raceway Support Methods: In addition to methods described in NECA 1, may be supported by openings through structure members, according to NFPA 70.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten communications items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Use approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Use expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated-driven threaded studs, provided with lock washers and nuts, may be used in existing standard-weight concrete 4 inches thick or

greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.

6. To Steel: .
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor communications materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in **Sections 09900 series for painting,** for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 270529

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 270536 - CABLE TRAYS FOR COMMUNI

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ladder cable tray.
2. Cable tray accessories.
3. Warning signs.

B. Related Requirements:

1. Section 260536 "Cable Trays for Electrical Systems" for cable trays and accessories serving electrical systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.

1. Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.
2. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:

    a. Vertical and horizontal offsets and transitions.
    b. Clearances for access above and to sides of cable trays.
    c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
    d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

3. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer, licensed in the state where Project is located, who is responsible for their preparation.
4. Design Calculations: Calculate requirements for selecting seismic restraints.
5. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.
2. Vertical and horizontal offsets and transitions.
3. Clearances for access above and to side of cable trays.
4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.

B. Seismic Qualification Data: Certificates, for cable trays, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.2 LADDER CABLE TRAY

A. Manufacturers: Subject to compliance with requirements:

1. ABB, Electrification Business.

2. Cooper B-line; brand of Eaton, Electrical Sector.
3. MP Husky USA Cable Tray & Cable Bus.
4. or approved equal

B. Description:

1. Configuration: Two longitudinal side rails with transverse rungs swaged or welded to side rails, complying with NEMA VE 1.
2. Width: unless otherwise indicated on Drawings.
3. Minimum Usable Load Depth: .
4. Straight Section Lengths: except where shorter lengths are required to facilitate tray assembly.
5. Rung Spacing: o.c.
6. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
7. Minimum Cable-Bearing Surface for Rungs: 7/8-inch width with radius edges.
8. No portion of the rungs shall protrude below the bottom plane of side rails.
9. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.
10. Fitting Minimum Radius: .
11. Splicing Assemblies: Bolted type using serrated flange locknuts.
12. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
13. Covers: type made of same materials and with same finishes as cable tray.

C. Materials and Finishes:

1. Steel:

   a. Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of .
   b. Steel Tray Splice Plates: ASTM A1011/A1011M, HSLAS, Grade 50, Class 1.
   c. Fasteners: Steel complies with the minimum mechanical properties of ASTM A510/A510M, Grade 1008.

   d. Finish: paint.

      1) Powder-Coat Enamel: Cable tray manufacturer's recommended primer and corrosion-inhibiting treatment, with factory-applied powder-coat paint.
      2) Epoxy-Resin Prime Coat: Cold-curing epoxy primer, MPI# 101.
      3) Epoxy-Resin Topcoat: Epoxy, cold-cured gloss, MPI# 77.

   e. Finish: Factory-standard primer, ready for field painting, with chromium-zinc-plated hardware according to ASTM F1136.
   f. Finish: Black oxide finish for support accessories and miscellaneous hardware according to ASTM D769.

2. Aluminum:

   a. Materials: Alloy 6063-T6 according to ANSI H35.1/H 35.1M for extruded components, and according to ANSI H35.1/H 35.1M for fabricated parts.

b. Hardware: .
c. Hardware for Aluminum Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F593 and ASTM F594.

2.3 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Barrier Strips: Same materials and finishes as for cable tray.

C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.4 WARNING SIGNS

A. Comply with requirements for identification in Section 270553 "Identification for Communications Systems."

B. Lettering: high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel."

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

B. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

C. Remove burrs and sharp edges from cable trays.

D. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb. Comply with requirements in Section 270529 "Hangers and Supports for Communications Systems."

E. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

F. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

G. Support bus assembly to prevent twisting from eccentric loading.

H. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

I. Locate and install supports according to and. Do not install more than one cable tray splice between supports.

J. Support wire-basket cable trays with, or, or.

K. Support or for wire-basket trays with diameter rods.

L. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

M. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in . Space connectors and set gaps according to applicable standard.

N. Make changes in direction and elevation using manufacturer's recommended fittings.

O. Make cable tray connections using manufacturer's recommended fittings.

P. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."

Q. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

R. Install cable trays with enough workspace to permit access for installing cables.

S. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

T. Install permanent covers, if used, after installing cable. Install cover clamps according to NEMA VE 2.

U. Clamp covers on cable trays installed outdoors with heavy-duty clamps.

V. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.2 CABLE TRAY GROUNDING

A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems."

B. Cable trays shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Cable trays with single-conductor power conductors shall be bonded together with a grounding conductor run in the tray along with the power conductors and bonded to the tray at 72-inch

intervals. The grounding conductor shall be sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors," and Article 392, "Cable Trays."

D. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.

E. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.3 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. Fasten cables on vertical runs to cable trays every 18 inches.

D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches.

E. Tie MI cables down every 36 inches where required to provide a 2-hour fire rating and every 72 inches elsewhere.

F. In existing construction, remove inactive or dead cables from cable trays.

3.4 CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.

3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION 270536

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 270543 - UNDERGROUND DUCTS A SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Products Installed, but Not Furnished, under T

1. See Section 260533 "Raceway and Box
   a. Type PVC raceways and fittings.
   b. Fittings for conduit, tubing, and cable.
   c. Solvent cements.

2. See Section 260543 "Underground Ducts and Raceways for Electrical Systems" for the following:

   a. Handholes and boxes for exterior underground wiring.
   b. Manholes for exterior underground wiring.
   c. Utility structure accessories.

1.2 DEFINITIONS

A. Conduit: A structure containing one or more ducts.

B. Duct: A single enclosed raceway for conductors or cable.

C. Duct Bank: An arrangement of conduit providing one or more continuous ducts between two points.

D. Handhole: In-ground structure with less than 2 m (6.5 ft) floor-to-ceiling working clearance.

E. Innerduct: A smaller tube used to subdivide large ducts into a conduit system for segregated placement of communications cables.

F. Manhole: In-ground structure with at least 2 m (6.5 ft) floor-to-ceiling working clearance.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at .

B. Preinstallation Coordination Meeting(s): For underground ducts and raceways. Conduct meeting(s) before.

1. Attendees: Installers, fabricators, representatives of manufacturers, and administrants for field tests and inspections. Notify Architect of scheduled meeting dates.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SELECTION OF UNDERGROUND DUCTS AND ACCESSORIES FOR COMMUNICATIONS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of underground ducts and accessories. Consult Architect for resolution of conflicting requirements.

B. Direct Buried Duct Banks:
   1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
   2. Space separators close enough to prevent sagging and deforming of ducts, with no less than 4 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
   3. Install ducts with a minimum of 3 inches between ducts for like services and 12 inches between power and signal ducts.
   4. Install top of duct bank at least 36 inches below finished grade, unless otherwise indicated.
   5. Set elevation of bottom of duct bank below the frost line.
   6. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and
   7. at building entrances through the floor.
      a. Couple steel conduits to ducts with adapters designed for this purpose, and
      b. encase coupling with 3 inches of concrete.
      c. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

C. Duct Entrances to Buildings:
   1. For entrances using steel or schedule 80 PVC conduit, transformations from underground duct to conduit shall be made 10 ft. minimum, outside the building wall and shall use fittings manufactured for the purpose. Install in accordance with the following:
      a. For entrances using Concrete-Encased Ducts, install reinforcing in duct banks through disturbed earth near buildings and excavations and coordinate duct bank with structural design at wall so duct bank is supported at wall without reducing structural or watertight integrity.
      b. For waterproof entrances: Where ducts enter buildings through a waterproofed floor or wall, a watertight entrance-sealing device shall be installed with the sealing gland assembly on the inside. The device shall be securely anchored into the masonry construction with one or more integral flanges and the membrane waterproofing secured to the device in a permanently watertight manner.

D. Underground-Line Warning Tape: In accordance with Section 270553 "Identification for Communications Systems."

E. Concrete Warning Planks: In accordance with Section 260543 "Underground Ducts and Raceways for Electrical Systems," except mark each plank with .

3.2 SELECTION OF HANDHOLES AND BOXES FOR COMMUNICATIONS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.

B. Provide handholes and boxes in accordance with Section 260543 "Underground Ducts and Raceways for Electrical Systems,"

3.3 SELECTION OF UNDERGROUND STRUCTURES AND ACCESSORIES FOR COMMUNICATIONS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of underground structures and accessories. Consult Architect for resolution of conflicting requirements.

B. Provide underground structures and accessories in accordance with requirements specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems,"

3.4 INSTALLATION

A. Earthwork: Comply with Section 260543 "Underground Ducts and Raceways for Electrical Systems."

B. Installation of Ducts and Duct Banks: Comply with Section 260533 "Raceway and Boxes for Electrical Systems" and Section 260543 "Underground Ducts and Raceways for Electrical Systems."

C. Installation of Structures: Comply with Section 260543 "Underground Ducts and Raceways for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Comply with Section 260543 "Underground Ducts and Raceways for Electrical Systems."

3.6 CLEANING

A. Comply with Section 260543 "Underground Ducts and Raceways for Electrical Systems."

END OF SECTION 270543

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 270544 - SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Round sleeves.
   2. Rectangular sleeves.
   3. Sleeve seal systems.
   4. Grout.
   5. Pourable sealants.
   6. Foam sealants.

B. Related Requirements:
   1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Wall Sleeves, Steel:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Advance Products & Systems, LLC.
      b. CCI Piping Systems.
      c. Flexicraft Industries.
      d. Or approved equal.
   2. Description: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

B. Wall Sleeves, Cast Iron:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Cast Iron Pipe Company.
      b. Flexicraft Industries.
      c. McWane Ductile.
      d. Or approved equal.
   2. Description: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.

C. Pipe Sleeves, PVC:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CCI Piping Systems.
      b. GPT; an EnPro Industries company.
      c. Metraflex Company (The).

d. Or approved equal.

2. Description: ASTM D1785, Schedule 40.

D. Molded Sleeves, PVC:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ABB, Electrification Business.
   b. Arlington Industries, Inc.
   c. Reliance Worldwide Corporation.
   d. Or approved equal.
2. Description: With nailing flange for attaching to wooden forms.

E. Molded Sleeves, PE or PP:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Crete-Sleeve.
   b. Eutsler Rubber
   c. Rol-Tec
   d. Or approved equal.
2. Description: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sheet Metal Sleeves, Galvanized Steel, Round:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Benefast.
   b. Specified Technologies, Inc.
   c. Protek
   d. Or approved equal.
2. Description: Galvanized-steel sheet; thickness not less than 0.0239-inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 RECTANGULAR SLEEVES

A. Sheet Metal Sleeves, Galvanized Steel, Rectangular:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Abesco Fire LLC.
   b. Specified Technologies, Inc.
   c. Wiremold; Legrand North America, LLC.
   d. Or approved equal.
2. Description:
   a. Material: Galvanized sheet steel.
   b. Minimum Metal Thickness:
      1) For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness must be 0.052 inch.
      2) For sleeve cross-section rectangle perimeter not less than 50 inches or with one or more sides larger than 16 inches, thickness must be 0.138 inch.

2.3 SLEEVE SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, LLC.
2. CALPICO, Inc.

3. Flexicraft Industries.
4. Or approved equal.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable or between pathway and cable.
1. Sealing Elements: rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: .
3. Connecting Bolts and Nuts: of length required to secure pressure plates to sealing elements.

2.4 GROUT

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. W. R. Meadows, Inc.
2. Mapei
3. Proflex
4. Or approved equal.

B. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.5 POURABLE SEALANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carlisle Syntec Systems.
2. GAF.
3. Johns Manville; a Berkshire Hathaway company.
4. Or approved equal.

B. Description: Single-component, neutral-curing elastomeric sealants of grade indicated below.
1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

C. Sustainability Criteria:
1. Verify sealant has a VOC content of g/L or less.

2.6 FOAM SEALANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Innovative Chemical Products (Building Solutions Group).
2. The Dow Chemical Company.
3. Tytan
4. Or approved equal.

B. Description: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

C. Sustainability Criteria:
1. Verify sealant has a VOC content of g/L or less.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.

b. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

C. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.

2. Seal space outside of sleeves with approved joint compound for wall assemblies.

D. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

E. Aboveground, Exterior-Wall Penetrations: Seal penetrations using pipe sleeves and mechanical sleeve seal systems. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

F. Underground, Exterior-Wall and Floor Penetrations:

1. Install pipe sleeves with integral waterstops. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing sleeve seal system. Install sleeve during construction of floor or wall.

2. Install steel pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing sleeve seal system. Grout sleeve into wall or floor opening.

3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.

B. Install conduits and cable with no crossings within the sleeve.

C. Fill opening around conduits and cables with expanding foam without leaving voids.

D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

3.3 INSTALLATION OF SLEEVE SEAL SYSTEMS

A. Install sleeve seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 270553 - IDENTIFICATION FOR COMMU

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Underground-line warning tape.
2. Signs.
3. Bands and tubes.
4. Cable ties.
5. Miscellaneous identification products.
6. Labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for communications identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule:

1. Outlets: Scaled drawings indicating location and proposed designation.
2. Backbone Cabling: Riser diagram showing each communications room, backbone cable, and proposed backbone cable designation.
3. Racks: Scaled drawings indicating location and proposed designation.
4. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations.

1.3 SYSTEM DESCRIPTION

A. The identification system shall be a coordinated system of permanently affixed labels of specified types that are used to uniquely identify each instance of a product and the space in which it is located. The following items shall be identified:

1. Cables.
   a. All cables shall have cable ID on the jacket at each end 4-6 inches from termination.
2. Telecommunications cabling cross-connect Blocks, including 66-blocks and 110-blocks.
3. Patch Panels.
4. Faceplates.
5. Individual connection jacks, receptacles, and terminals.

6. Remote Equipment enclosures/cabinets not within telecommunications rooms.
7. Equipment racks and cabinets within telecommunications rooms.
8. Telecommunications Backboards.
9. Rooms containing communications or security products.
10. Device boxes, junction boxes, pull boxes, floor boxes, wall boxes, ceiling boxes and other forms of boxes used for passage, splicing, or termination of cables.
11. Equipment power cord plugs.

B. The labeling schema used for horizontal, and backbone structured cabling systems shall be TIA/EIA-606-A, or most current version, compliant.

C. Label Type Schedule:

LABEL TYPE SCHEDULE		
APPLICATION	TYPE	NOTES
EQUIPMENT RACK - FRONT	DB	
EQUIPMENT RACK - REAR	DB	
PATCH PANELS – BACKBONE CABLES	CB	
PATCH PANELS – HORIZONTAL CABLES	CB	
FACEPLATES – HORIZONTAL	CB	CLEAR BACK
FACEPLATES - CUSTOM	DE	ENGRAVED; SCREENED
FACEPLATES – MULTISERVICE	CB	CLEAR BACK; ENGRAVED
OUTLETS – HORIZONTAL	CB	
OUTLETS – CUSTOM FACEPLATE	DB	
CABLES - HORIZONTAL	CA	
CABLES - BACKBONE	CA	
AV CABLES	CA	
COMMUNICATIONS BACKBOARDS	DC	
CONNECTING BLOCKS	PI	WITH PLASTIC COVER
FIBER OPTIC PANEL	PI	
ABBREVIATED DEFINITIONS: CA=SELF LAMINATING WRAP-AROUND), CB=SELF LAMINATING DA = LAMACOID, DB=TAPE TYPE, DC=IMPRINTED/ETCHED; DE=ENGRAVED PI=PRINTED INTEGRAL LABEL; RA=LAMACOID SEE SECTION 270553 FOR SPECIFICATIONS OF VARIOUS LABEL TYPES		

PART 2 - PRODUCTS

2.1 GENERAL

A. Products furnished of each Type shall be manufactured by a single manufacturer, bear the same brand name, be the same finish color and texture, and be from the same product model series, except where otherwise indicated.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Brady
   2. Brother
   3. Casio
   4. Hubbell
   5. Panduit
   6. Hellerman/Tyton
   7. Thomas and Betts
   8. or approved equal

2.3 PERFORMANCE

A. Labels shall be designed to remain permanently affixed under typical environmental conditions for the life of the product identified.

B. Nomenclature shall be permanent and non-fading under typical environmental conditions.

C. Adhesive labels shall remain attached to the affixed product in continuous conditions of 90% relative humidity and temperatures of 100-degrees Fahrenheit (38-degrees Celsius).

2.4 CABLE INFRASTRUCTURE LABELS

A. Type CA:

   1. Self-laminating type.
   2. Adhesive backed.
   3. Opaque solid-color background area, color for nomenclature: White.
   4. Clear self-laminating wrap-around cover for protection of nomenclature.
   5. Available in a variety of heights and widths to suit the cable being labeled.
   6. Printing area of the label available in a wide variety of sizes to accommodate the specific nomenclature to be applied.
   7. Overall label width: Minimum 1 inch (25 mm); Maximum 2 inches (50 mm).
   8. Opaque printing area length: Minimum 1/2 inch (12 mm); Maximum 1-1/4 times the cable circumference.
   9. Self-laminating wrap length: 1-1/2 to 2-1/2 times the cable circumference.
   10. Bold computer-generated and commercial printer applied high-contrast project

B. Type CB - Tape Type:
   1. Self-laminating type.
   2. Adhesive backed.
   3. Opaque solid-color background area, color for nomenclature: White.
   4. Available in a variety of heights and widths to suit the termination being labeled.
   5. Printing area of the label available in a wide variety of sizes to accommodate the specific nomenclature to be applied.
   6. Overall label width: Minimum 1 inch (25 mm); Maximum 2 inches (50 mm).
   7. Opaque printing area length: Minimum 1/2 inch (12 mm); Maximum 1-1/4 times

the cable circumference.
8. Bold computer-generated and commercial printer applied high-contrast project and system specific nomenclature.

C. Type PI – Tape Type:
1. Integral card type.
2. Opaque solid-color background area, color for nomenclature: White.
3. Heights and widths to suit the termination being labeled.
4. Printing area of the label to accommodate the specific nomenclature to be applied.
5. Bold computer-generated and commercial printer applied high-contrast project and system specific nomenclature.
6. Provide with clear plastic covers to protect label.

2.5 DEVICE LABELS

A. Type DB – Tape Type:
1. Tape-type construction.
2. Material: Polyester.
3. Working temperature range: -40 to 248 degrees Fahrenheit (-40 to 120 degrees Celsius)
4. Opaque solid-color background over which nomenclature is applied.
5. Self-adhesive backing for adhesion to labeled item.
6. Designed for thermal-transfer based machine imprinting of nomenclature.
7. Available in a wide-variety of manufacturer sizes.
8. Available with a wide-variety of background colors.
9. Available with a variety of different nomenclature colors.

2.6 CABLE LABEL HEATSHRINK

A. Should any condition arise in which cable labels are used that are neither self-laminating nor permanent, then properly sized clear heat-shrink shall be applied over the label to make it permanent.

2.1 CABLE LABEL HEATSHRINK

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
1. Label each instance of each product.
2. Label each connector of each product.
3. Install labels so that they are legible after installation.
4. Install labels so they are parallel to the dominant visual lines of the product identified.

5. Install labels of the appropriate size for the application.
6. Maintain consistency in label sizes that are used for labeling similar applications.
7. Install secondary labels on the rear of products that are mounted within racks, within equipment enclosures/cabinets, within furniture or casework, and in any application where the rear of the product is accessed for termination, installation, service, operation or adjustment.
8. Coordinate "final" room numbers or identifiers with the Owner prior to performing work; all labeling shall perform to operational room identifiers. If actual room numbers differ from architectural room numbers both shall be included on the as-built floorplans.
9. Campus environments with multiple buildings shall add a building identifier to the labeling in each building.

B. Cables:
   1. General:
      a. Uniquely identify each cable so that no two cables serving a single system utilize the same identifier.
      b. Cables that terminate within different architectural spaces shall include both the source and destination space identifiers on the label in addition to a unique cable identifier
      c. Install a primary label near the end of cable.
      d. Install a secondary label (with identical nomenclature as the primary label) near the ends of the cable at such point that the label is viewable and readable when the cable is in its final dressed position.
      e. Utilize specified labeling schemas. Substitute schema may be considered if submitted to, reviewed and returned by the Designer without exceptions.
   2. Horizontal Cables:
      a. Label in accordance with TIA/EIA-606-A, or most current version.
      b. Horizontal labeling schema:
         1) "Communication Room Identifier"–"Outlet Room Number"–"Rack, Patch Panel and Patch Panel Port Number."
   3. Backbone Cables:
      a. Label in accordance with TIA/EIA-606-A, or most current version.
      b. In addition to labels at each end, apply a label at each junction/pull point to identify the cable.
      c. Cabling labeling schema:
         1) Service designation and number: CB = Copper Backbone, FB = Fiber Backbone, VB = Video Backbone (e.g., CB.01, FB.01, FB.02, VB.01)
         2) Interconnected Communication Room designations (e.g., ER01–TR04)
         3) Composite Examples:
            a) Example: CB.01–ER01–TR02.
            b) Example: CB.01–ER01–TR03.
   4. Patch Cables:
      a. Label with the same unique identifier at each end.
   5. Multi-Cable Assemblies and Tethers:
      a. Label the overall assembly, sleeve, or jacket (as applicable) at both ends.
      b. Label each individual cable member at both ends.
      c. If the cable assembly features connectors on the end of any cable member, affix labels also on the connector. Use user-friendly nomenclature that identifies the use of the connector and the port to which it mates.

d. See illustrations at the end of this Section.

C. Faceplates and Outlets:
1. Faceplates – General:
a. Label each faceplate with a Device.ID label.
1) Exception: Faceplates used exclusively for Horizontal cables do not need to feature a Device.ID label.
2) Exception: Blank faceplates are not required to have a Device.ID label, except where noted.
b. Use labels with a clear background or a background color that matches the plate. On custom fabricated faceplates, label shall be integral to the plate by means of engraving or screening or other approved means.
c. See illustrations at the end of this Section.
2. Faceplates – with Horizontal Cables:
a. Label modular outlet frame(s) with a label identifying origination and destination rooms of the horizontal cable(s) present at the faceplate. When non-modular faceplates are used, affix the label to the plate.
3. Outlets/Connectors – General:
a. Label each outlet.
4. Outlets/Connectors – Horizontal Cables:
a. Identify the specific patch panel and port to which the opposite end of the cable is connected.
5. Use .35” tape with 9 pt Arial font.

D. Cross-Connect Blocks:
1. 110-Style:
a. Label the front of the block directly above or below (as indicated by the manufacturer) each position in the block.
b. Label connections in numerical order and corresponding to the faceplate outlet schema (horizontal cabling) or the opposite end labeling schema (backbone cabling), dependent upon use.
c. Label the upper left corner of each block designating the service of that particular block.
2. 66-Style:
a. Label the front of the block directly above or below (as indicated by the manufacturer) each position in the block.
1) Label connections in numerical order and corresponding to the faceplate outlet schema (horizontal cabling) or the opposite end labeling schema (backbone cabling), dependent upon use.
b. Label the upper left corner of each block designating the service of that particular block.

E. Patch Panel:
1. Chassis – General:
a. Label each panel chassis with a Device.ID.
1) Affix chassis labels aligned with the left or right edge of the product.
2) Locate consistently across chassis in the rack and throughout the project.
2. Chassis – for Horizontal Cabling:
a. In lieu of or in addition to the Device.ID uniquely label the chassis for each panel within each Communication Room in accordance with the following schema:
1) “Letter” or “Letter Letter” where letters A-Z or dual letter assemblies

2) AA-ZZ are valid.

3. Individual Connectors – for Horizontal Cabling:
   a. Label each connector on each panel in order from Left to Right and Top to Bottom 1 to "X," where "X" is the number of connector spaces on the panel.
   b. In addition, the connector label nomenclature shall clearly identify the room number in which the opposite end of the cable is terminated.
4. Individual Connectors – Others:
   a. Label each connector.
   b. Use color-coded nomenclature acceptable to the Designer.

F. Patch Bays (e.g., Audio, Video):
1. Label each patch bay with a Device.ID.
2. Label each connector on the patch bay.
3. Use color-coded nomenclature acceptable to the Designer.
4. Where the patch bay features an integral labeling strip, label the connectors using the strip following the techniques recommended by the manufacturer.
5. Where the Drawings depict additional means of labeling, provide additional labels with designer reviewed nomenclature.

G. Communications Backboards/Telecommunication Back Boards (TBB):
1. Label each full-size and each partial sheet of backboard material (e.g., plywood).
2. Label each backboard in numerical order using a unique identifier beginning at one and up to the number of boards present in the space.
3. Label boards in a clockwise fashion beginning with the interior surface of the room immediately adjacent to the frame of the primary entry door into the space.
4. Each increment of 4-linear feet per wall shall be assigned a unique value.
5. Locate the labels horizontally centered and top-aligned with each backboard.
6. Use Lamacoid type labels.

H. Equipment Racks:
1. Label each equipment rack with a unique identifier.
2. Accurately record the nomenclature on the project as-built documentation.
3. Affix a primary label to the front of the rack.
4. Affix a secondary label to the rear of the rack.
5. Locate labels on the upper-most part of the rack, typically the frame, in an area that is clearly visible if doors are installed and closed.
6. Label each equipment rack to match the designation indicated on the floor plans
7. Labels shall be black text on white background.

3.2 LABEL PROTECTION

A. Cable Labels: If at any time during the course of the project a condition arises for which cable labels are used that are neither self-laminating nor permanent, then such labels shall be protected with properly sized clear heat-shrink to protect the label and to make it permanent.

3.3 RECORD DRAWINGS

A. Accurately record the labels used for identifying items within the project as-built documentation.

END OF SECTION 270553

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 271100 - COMMUNICATIONS EQUIPME

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backboards.
2. Boxes, enclosures, and cabinets.
3. Power strips.

B. Related Requirements:

1. Section 270536 "Cable Trays for Communications Systems" for cable trays and accessories.
2. Section 271313 "Communications Copper Backbone Cabling" for copper data cabling associated with system panels and devices.
3. Section 271323 "Communications Optical Fiber Backbone Cabling" for optical-fiber data cabling associated with system panels and devices.
4. Section 271513 "Communications Copper Horizontal Cabling" for copper data cabling associated with system panels and devices.

1.2 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. BICSI: Building Industry Consulting Service International.

C. RCDD: Registered communications distribution designer.

D. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

E. TGB: Telecommunications grounding bus bar.

F. TMGB: Telecommunications main grounding bus bar.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail showing standoff insulators and wall mounting brackets.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **qualified** layout technician, installation supervisor, and field inspector.

B. Seismic Qualification Data: Certificates, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of .
2. Installation Supervision: Installation shall be under direct supervision of the Engineer who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Equipment shall withstand the effects of earthquake motions determined according to .

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified."

2.2 BACKBOARDS

A. Backboards: Plywood, 3/4 by 48 by 96 inches.

B. Backboard Paint: .

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Appleton; Emerson Electric Co., Automation Solutions.
2. Hubbell Electrical Solutions; Hubbell Incorporated.
3. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
4. Substitutions: or approved equal

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets shall be listed and labeled for intended location and use.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, Type FD, , with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, with gasketed cover.

H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

I. Device Box Dimensions: .

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: .
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

K. Cabinets:

1. NEMA 250, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 POWER STRIPS

A. Comply with requirements in Section 271116 "Communications Racks, Frames, and Enclosures."

B. Power Strips: Comply with UL 1363.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Rack mounting, with flanges.
3. LED indicator lights for power and protection status.
4. LED indicator lights for reverse polarity and open outlet ground.
5. Circuit Breaker and Thermal Fusing:

    a. When protection is lost, circuit opens and cannot be reset.
6. Rocker-type on-off switch illuminated when in on position.
7. Surge Protection: UL 1449, Type 3.

    a. Maximum Surge Current, Line to Neutral: .
    b. Protection modes shall be line to neutral, line to ground, and neutral to ground.
    c. UL 1449 Voltage Protection Rating for line to neutral and line to ground shall be and. for neutral to ground.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI's "Telecommunications Distribution Methods Manual" for layout of communications equipment spaces.

C. Comply with BICSI's "Information Technology Systems Installation Methods Manual" for installation of equipment in communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in tracks and in room. Coordinate service entrance configuration with service provider.

1. Meet jointly with systems providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize configurations and space requirements of communications equipment.
4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

G. Backboards:

1. Install from 6 inches to 8 feet, 6 inches above finished floor. If plywood is fire rated, ensure that fire-rating stamp is visible after installation.
2. Paint all sides of backboard with two coats of paint.
3. Comply with requirements for backboard installation in BICSI's "Information Technology Systems Installation Methods Manual" and TIA-569-D.

3.3 SLEEVE AND SLEEVE SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI's "Information Technology Systems Installation Methods Manual," "Firestopping Practices" Ch.

END OF SECTION 271100

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 271116 - COMMUNICATIONS RACKS, FI

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Communication Systems equipment.
2. Grounding.
3. Labeling.

B. Related Requirements:

1. Section 271110 "Communications Equipment Room Fittings" for backboards and accessories.
2. Section 270526 "Grounding and Bonding for Telecommunications Equipment" for TMGBs and TGBs.
3. Section 270536 "Cable Trays for Communications Systems" for cable trays and cable tray accessories.
4. Section 271313 "Communications Copper Backbone Cabling" for copper data cabling associated with system panels and devices.
5. Section 271323 "Communications Optical Fiber Backbone Cabling" for optical-fiber data cabling associated with system panels and devices.
6. Section 271513 "Communications Copper Horizontal Cabling" for copper data cabling associated with system panels and devices.

1.2 DEFINITIONS

A. Access Provider: An operator that provides a circuit path or facility between the service provider and user. An access provider can also be a service provider.

B. BICSI: Building Industry Consulting Service International.

C. LAN: Local area network.

D. RCDD: Registered communications distribution designer.

E. Service Provider: The operator of a telecommunications transmission service delivered through access provider facilities.

F. TGB: Telecommunications grounding bus bar.

G. TMGB: Telecommunications main grounding bus bar.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
2. Include rated capacities, operating characteristics, electrical characteristics, certifications, standards compliance, and furnished specialties and accessories.

B. Shop Drawings: For communications racks, frames, and enclosures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Equipment Racks and Cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of TGB and its mounting detail showing standoff insulators and wall-mounting brackets.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **qualified** layout technician, installation supervisor, and field inspector.

B. Seismic Qualification Data: Certificates, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions. Base certification on the maximum number of components capable of being mounted in each rack type. Identify components on which certification is based.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under direct supervision of project manager.
2. Installation Supervision: Installation shall be under direct supervision of the engineer who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as to perform on-site inspection.

PART 2 - PRODUCTS (PROCURED BY OWNER, INSTALLED BY CONTRACTOR)

2.1 PERFORMANCE REQUIREMENTS

A. UL listed.

B. RoHS compliant.

C. Compliant with requirements of the Payment Card Industry Data Security Standard.

2.2 BACKBOARDS

A. Backboards: Plywood, 3/4 by 48 by 96 inches.

2.3 COMMUNICATIONS SYSTEM EQUIPMENT

A. Refer to Contract drawing CS500, CS501, CS502, CS503, and CS504 for full Communication Systems part numbers procured by Owner.

2.4 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chatsworth Products, Inc.
2. Harger Lightning & Grounding; business of Harger, Inc.
3. Panduit Corp.
4. Substitutions: or approved equal

C. Rack and Cabinet TGBs: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-606-B. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted TGB: Terminal block, with stainless-steel or copper-plated hardware for attachment to cabinet.
2. Rack-Mounted Horizontal TGB: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical TGB: 72 or 36 inches long, with stainless-steel or copper-plated hardware for attachment to rack.

2.5 LABELING

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Comply with BICSI TDMM for layout of communications equipment spaces.

C. Comply with BICSI ITSIMM for installation of communications equipment spaces.

D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

E. Coordinate layout and installation of communications equipment in racks and room. Coordinate service entrance configuration with service provider.

1. Meet jointly with system providers, equipment suppliers, and Owner to exchange information and agree on details of equipment configurations and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust configurations and locations of distribution frames, cross-connects, and patch panels in equipment spaces to accommodate and optimize configuration and space requirements of telecommunications equipment.
4. Adjust configurations and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in equipment room.

F. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.2 GROUNDING

A. Comply with NECA/BICSI 607.

B. Install grounding according to BICSI ITSIMM, "Bonding, Grounding (Earthing) and Electrical Protection" Ch.

C. Locate TGB to minimize length of bonding conductors. Fasten to wall, allowing at least 2 inches of clearance behind TGB. Connect TGB with a minimum No. 4 AWG grounding electrode conductor from TGB to suitable electrical building ground. Connect rack TGB to near TGB or the TMGB.

1. Bond the shield of shielded cable to patch panel, and bond patch panel to TGB or TMGB.

3.3 IDENTIFICATION

A. Coordinate system components, wiring, and cabling complying with TIA-606-B. Comply with requirements in Section 270553 "Identification for Electrical Systems."

B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

C. Paint and label colors for equipment identification shall comply with TIA-606-B for level of administration.

D. Labels shall be machine printed. Type shall be in height.

END OF SECTION 271116

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 271313 - COMMUNICATIONS COPPER B

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access Control composite cable.

B. Products Installed, but Not Furnished, under T

1. See Section 270553 "Identification for Communications Systems" for communications equipment labels.
2. See Section 271513 "Communications Copper Horizontal Cabling" for Type CM, CMG, and CMX cabling.

1.2 DEFINITIONS

A. Cable Types:

1. FTP: Foil shielded twisted pair.
2. F/FTP: Bundle of FTP cables with overall foil shield.
3. F/UTP: Bundle of UTP cables with overall foil shield.
4. S/FTP: Bundle of FTP cables with overall braided shield.
5. S/UTP: Bundle of UTP cables with overall braided shield.
6. UTP: Unshielded twisted pair.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

1.3 SEQUENCING

A. Wet-work in spaces must be completely dry, and HVAC system must be operating and maintaining ambient temperature and humidity conditions within manufacturer's recommended limits, before delivering and installing cables and connecting materials.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Access Control composite cable.

B. Shop Drawings:

1. Cable labeling schedules.
2. Cabling administration diagrams.
3. Wiring diagrams.
4. Cable testing plan.

C. Field quality-control reports.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Access Control composite cable.

B. Field Reports:

1. Factory Test Reports:

a. Access Control composite cable.

1.6 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each cable for open and short circuits.

1.8 WARRANTY FOR COMMUNICATIONS COPPER BACKBONE CABLE ASSEMBLIES

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed communications copper backbone cable assemblies perform in accordance with specified requirements and agrees to repair or replace cable assemblies that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 ACCESS CONTROL COMPOSITE CABLES

A. Description: This category covers multiple conductor jacketed communications cable for access control circuits for use in risers and plenums as described in Article 800 of NFPA 70.
   1. Composite Cable
      a. Use for security system access control equipment and sensors.
   2. Manufacturer
      a. Belden or approved equal
      b. Southwire
      c. West Penn Wire
      d. Substitutions: or approved equal
   3. Access control cable shall be:
      a. Conductor/Pair count: as indicated in RFC drawings, refer to EPD drawing package for cable/conduit schedules.
      b. Environment: industrial/hostile
      c. Twisted pair includes conductor wires, drain wire and outer shield.
      d. Conductor wire: one pair 18AWG tinned, stranded copper
      e. Drain wire: 24AWG tinned copper
      f. Shield: Tape type outer shield of aluminum foil-polyester tape w/shortening fold
      g. Outer jacket:
         1) Riser: Flame Retardant (FR) PVC.
         2) Plenum and other areas: see 2.1 above
      h. Component Jacket Marking
         1) Example: LOCK POWER DOOR / ZONE A B C D E / 0 1 2 3 4 5 6 7 8 9 18 AWG/4C PLENUM
   4. Component cable application and color coding:
      a. Component 1
         1) Cable type:18 AWG x 4 conductors
         2) Application: Lock power
         3) Component Jacket color: Purple
      b. Component 2
         1) Cable type: 22 AWG x 3 twisted pairs
         2) Application: Card reader
         3) Component Jacket color: Yellow
      c. Component 3
         1) Cable type: 22 AWG x 4 conductors
         2) Application: Request to exit
         3) Component Jacket color: Red
      d. Component 4
         1) Cable type: 22 AWG x 2 conductors
         2) Application: Door contact
         3) Component Jacket color: Green

PART 3 - EXECUTION

3.1 PREPARATION

A. Shop Drawings: Prepare and submit the following:

1. Cable Labeling Schedules: Submit electronic files.
2. Cabling Administration Diagrams: Submit diagrams and supporting electronic files.

    a. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

3. Wiring Diagrams:

    a. Access Control rooms plans and elevations.
    b. Telecommunications pathways.
    c. Telecommunications system access points.
    d. Telecommunications grounding system.

4. Cross-Connect and Patch Panel Details: Include mounting assemblies, elevations, and physical relationship between installed components.
5. Twisted-Pair Cable Testing Plan: Include list of cables to be tested, identification of tests to be performed, pass/fail criteria, and copy of testing procedures (may be separate volume). Indicate Installer's required tests for warranty compliance.

3.2 SELECTION OF COMMUNICATIONS COPPER BACKBONE CABLING

A. Air-Handling Spaces:

1. Type CMP .
2. Type CMR or Type CMP in metallic conduit installed in accordance with Rule 300.22 of NFPA 70.

B. Vertical Chases:

1. Type CMR.
2. Type CMP or Type CMR.

3.3 INSTALLATION OF COMMUNICATIONS COPPER BACKBONE CABLING

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation:

1. Communications Cable Assemblies: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with BICSI N1.
2. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

    a. Provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure.
    b. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters may not be used as part of backbone cabling.

2. Drawings indicate general arrangement of pathways and fittings.
3. Wiring Methods:

    a. Raceway and Tray: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters. Conceal raceway and cables, except in unfinished spaces.

        1) Install plenum cable in environmental air spaces, including plenum ceilings.

    b. Open-Cable: Route conductors and cables in accessible ceilings, walls, and floors where possible.
    c. Within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install cables parallel with or at right angles to sides and back of enclosure.

4. General Requirements for Cabling:

    a. Install 110-style IDC termination hardware unless otherwise indicated.
    b. Do not untwist twisted-pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
    c. Terminate all conductors; no cable may contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
    d. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inch and not more than 6 inch from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
    e. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
    f. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Use lacing bars and distribution spools.
    g. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
    h. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps may not be used for heating.
    i. In the communications equipment room, install 10 ft long service loop on each end of cable.
    j. Pulling Cable: Monitor cable pull tensions.

5. Open-Cable Installation:

    a. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
    b. Suspend twisted-pair cabling, not in a wireway or pathway, a minimum of 8 inch above ceilings by cable supports not more than apart.
    c. Cable may not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

6. Installation of Cable Routed Exposed under Raised Floors:

    a. Install plenum-rated cable only.
    b. Install cabling after the flooring system has been installed in raised floor areas.
    c. Coil cable long not less than in diameter below each feed point.

7. Group connecting hardware for cables into separate logical fields.
8. Separation from EMI Sources:

    a. Comply with BICSI N1 for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
    b. Separate open communications cables or cables in nonmetallic raceways from unshielded power conductors and electrical equipment as follows:

        1) Power Rating Less Than 2 kVA: Minimum 5 inch.
        2) Power Rating between 2 and 5 kVA: Minimum 12 inch.
        3) Power Rating More Than 5 kVA: Minimum 24 inch.

    c. Separate communications cables in grounded metallic raceways from unshielded power lines or electrical equipment as follows:

        1) Power Rating Less Than 2 kVA: Minimum 2-1/2 inch.
        2) Power Rating between 2 and 5 kVA: Minimum 6 inch.
        3) Power Rating More Than 5 kVA: Minimum 12 inch.

    d. Separate communications cables in grounded metallic raceways from power lines and electrical equipment located in grounded metallic conduits or enclosures as follows:

        1) Power Rating Less Than 2 kVA: No minimum distance.
        2) Power Rating between 2 and 5 kVA: Minimum 3 inch.
        3) Power Rating More Than 5 kVA: Minimum 6 inch.

    e. Separate communications cables from electrical motors and transformers rated 5 kVA or 5 HP and larger minimum 48 inch.
    f. Separate communications cables from fluorescent luminaires minimum 5 inch.

9. Identify system components, wiring, and cabling in accordance with TIA-606.

    a. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

b. Paint and label colors for equipment identification must comply with TIA-606 for level of administration.

10. Cable and Wire Identification:

    a. Label each cable within 4 inch of each termination and tap, where it is accessible in cabinet or junction or outlet box, and elsewhere as indicated.
    b. Each wire connected to building-mounted devices is not required to be numbered at device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
    c. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 ft.
    d. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.

        1) Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from panel or cabinet to building-mounted device, with name and number of particular device.
        2) Label each unit and field within distribution racks and frames.

    e. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use different color for jacks and plugs of each service.

11. Cable Schedule: Install in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish electronic copy of final comprehensive schedules for Project.
12. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

D. Interfaces with Other Work:

1. Entrance Facilities: Coordinate backbone cabling with Section 271100 "Communications Equipment Room Fittings" for cabinets, racks, and protectors and demarcation point provided by communications service provider.
2. Coordinate with Section 078413 "Penetration Firestopping" for sealing fire-rated penetrations.
3. Coordinate with Section 270526 "Grounding and Bonding for Communications Systems" for grounding communications cabling and connectors.
4. Coordinate with Section 270529 "Hangers and Supports for Communications Systems" for installation of cable supports.
5. Coordinate with Section 270536 "Cable Trays for Communications Systems" for installation of cable trays.

3.4 FIELD QUALITY CONTROL OF ACCESS CONTROL CABLING

A. Field tests and inspections must be witnessed by

B. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.
2. Visually inspect jacket materials for certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568.1.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments must meet or exceed applicable requirements in TIA-568.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

C. Nonconforming Work:

1. Cable assemblies will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective cable assemblies and retest.

D. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

3.5 PROTECTION

A. After installation, protect cable assemblies and accessories from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 271313

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 271323 - COMMUNICATIONS OPTICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Type OFCP optical fiber cable.
   2. Optical fiber cable connecting hardware

1.2 DEFINITIONS

A. Conductive Cable: Cable containing non-current-carrying electrically-conductive members such as metallic strength members and metallic vapor barriers.

B. Cross-Connect: A facility enabling termination of cable elements and their interconnection or cross-connection.

C. Type OFCP: Conductive cable for use in plenums, ducts, and other spaces used for environmental air.

D. Type OFCR: Conductive cable for use as riser in vertical shafts or from floor to floor.

E. Type OFNP: Nonconductive cable for use in plenums, ducts, and other spaces used for environmental air.

F. Types OFC and OFCG: Conductive cable for general purpose use.

G. Types OFN and OFNG: Nonconductive cable for general purpose use.

1.3 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.4 ACTION SUBMITTALS

A. Product Data:

   1. For each type of product.

B. Shop Drawings:

   1. System Labeling Schedules:

      a. Electronic copy of labeling schedules, in software and format selected by Owner.

b. Electronic copy of labeling schedules that are part of cabling and asset identification system of software.

2. Cabling administration drawings and printouts.
3. Wiring diagrams showing typical schematic arrangement, including the following:

a. Telecommunications rooms plans and elevations.
b. Telecommunications pathways.
c. Telecommunications system access points.
d. Telecommunications grounding system.
e. Cross-connects.
f. Patch panels.
g. Patch cords.

4. Cross-Connect and Patch-Panel Drawings: Detail mounting assemblies and show elevations and physical relationship between installed components.

C. Certificates:

1. For each type of product.

D. Field Quality-Control Submittals:

1. Optical fiber cable testing plan.
2. Field quality-control reports.

1.5 INFORMATIONAL SUBMITTALS

A. Source Quality-Control Submittals:

1. Source quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For optical fiber cable, splices, and connectors.

B. Maintenance Contracts:

1. Software service agreement.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet-work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

B. Store materials protected from exposure to extreme or harmful environmental conditions and at temperature and humidity levels recommended by the manufacturer.

PART 2 - PRODUCTS

2.1 TYPE OFCP OPTICAL FIBER CABLE

A. Description: This category covers jacketed optical fiber cable for use in vertical runs in plenums, ducts, or other spaces used for environmental air within buildings in accordance with Article 770 of NFPA 70 containing noncurrent-carrying electrically conductive materials.

B. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN QAYK; including UL 1651.
3. General Characteristics:

    a. Performance: TIA-568.3.
    b. Inside Plant Mechanical Properties: ICEA S-83-596.
    c. Inside-Outside Plant Mechanical Properties: ICEA S-104-696.
    d. Jacket:

        1) Cable cordage jacket, fiber, unit, and group color in accordance with TIA-598.
        2) Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inch.

C. Type OFCP, Designation OM3, Multimode Optical Fiber Cable:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Belden Inc.
    b. General Cable; Prysmian Group North America.
    c. Prysmian Cables and Systems; Prysmian Group North America.
    d. Substitutions: or approved equal
2. Source Limitations: Obtain products from single manufacturer.
3. Additional Characteristics:

    a. Construction: TIA-492AAAA; 62.5 µm core diameter, 125 µm cladding diameter.
    b. Minimum Overfilled Modal Bandwidth-Length Product: 200 MHz-km at 850 nm wavelength; 500 MHz-km at 1300 nm wavelength.

4. Options:

    a. Configuration: 50/125, fiber, tight buffer, optical fiber cable.
    b. Maximum Attenuation: at 850 nm wavelength; at 1300 nm wavelength.
    c. Jacket Color: .
    d. Armor: .

2.2 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden Inc.
2. CommScope, Inc.
3. Corning Optical Communications; Corning Incorporated.
4. Substitutions: or approved equal

B. Performance Criteria:

1. Fiber Optic Connector Intermateability Standard (FOCIS) specifications of TIA-604 series.
2. TIA-568.3.

C. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

D. Patch Cords: Factory-made, dual-fiber cables in 36 inch lengths.

E. Connector Type: **complying with TIA-604-5,**] connectors.

F. Plugs and Plug Assemblies:

1. Male; color-coded modular telecommunications connector designed for termination of single optical fiber cable.
2. Insertion loss not more than dB.
3. Marked to indicate transmission performance.

G. Jacks and Jack Assemblies:

1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of single optical fiber cable.
2. Insertion loss not more than dB.
3. Marked to indicate transmission performance.
4. Designed to snap-in to patch panel or faceplate.

2.3 SOURCE QUALITY CONTROL

A. Owner will witness required factory tests. Notify Architect at least 14 days before date of tests and indicate their approximate duration.

B. Testing Administrant: qualified testing agency to evaluate cables.

C. Tests and Inspections:

1. Test and inspect multimode optical fiber cables, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with TIA-526-14 and TIA-568.3 before delivering to site. Affix label with name and date of certification of system compliance.
2. Test and inspect pre-terminated optical fiber cable assemblies, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with TIA-526-14 and TIA-568.3 before delivering to site. Affix label with name and date of certification of system compliance.

D. Nonconforming Work:

1. Cables that do not pass tests and inspections will be considered defective.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate backbone cabling with protectors and demarcation point provided by communications service provider.

3.2 SELECTION OF OPTICAL FIBER TYPE

A. Installed in Vertical Shaft or Floor-to-Floor Riser:

1. Conductive:
   a. in metallic conduit.

B. Installed in Plenum, Duct, or Other Space Handling Environmental Air:

1. Conductive:

   a. Type OFCP.
   b. in metallic conduit.

C. Installed in Location Other Than Riser or Plenum:
1. Conductive: in metallic conduit.

3.3 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

A. Optical fiber backbone cabling system must provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters may not be used as part of backbone cabling.

C. Comply with BICSI N1, NECA NEIS 1, and NECA NEIS 301.

D. Backbone cabling system must comply with transmission standards in TIA-568.1.

E. Telecommunications Pathways and Spaces: Comply with TIA-569.

F. Wiring Methods:

1. Not in Raceway: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
2. In Raceway: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

    a. Install plenum cable in environmental airspaces, including plenum ceilings.
    b. Comply with requirements for pathways specified in Section 270528 "Pathways for Communications Systems."

3. In Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

G. Optical Fiber Cabling Installation:

1. Comply with TIA-568.1 and TIA-568.3.
2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
3. Terminate all cables; no cable may contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inch and not more than 6 inch from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps may not be used for heating.
9. In communications equipment room, provide 10 ft long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
11. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

H. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable may not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

I. Installation of Cable Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after flooring system has been installed in raised floor areas.
3. Coil cable long not less than in diameter below each feed point.

J. Group connecting hardware for cables into separate logical fields.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569, Annex A, "Firestopping."

C. Comply with BICSI ITSIMM, "Firestopping" Chapter.

3.5 GROUNDING

A. Install grounding in accordance with BICSI ITSIMM, "Grounding (Earthing), Bonding, and Electrical Protection" Chapter.

B. Comply with TIA-607 and NECA/BICSI-607.

C. Locate grounding bus bar to minimize length of bonding conductors. Fasten to wall allowing at least 2 inch clearance behind grounding bus bar. Connect grounding bus bar with minimum 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to grounding bus bar, using not smaller than 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

1. Administration Class: .
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification must comply with TIA-606 for level of administration.

C. Comply with requirements in Section 271523 "Communications Optical Fiber Horizontal Cabling" for cable and asset management software.

D. Cable Schedule: Install in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish electronic copy of final comprehensive schedules for Project.

E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

F. Cable and Wire Identification:

1. Label each cable within 4 inch of each termination and tap, where it is accessible in cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 ft.
4. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use different color for jacks and plugs of each service.

G. Labels must be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA 606, for the following:

1. Flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Testing Preparation, Tests and Inspections:
1. Verify through Optical Time Dimension Reflectometer (OTDR) testing as well as visual inspection of manufacturers testing results, the quality of the fiber optic cable being installed.
   a. Verify through power meter testing the attenuation of all point-to-point fiber optic strands.
   b. Verify through OTDR testing the integrity of the point-to-point connections, the final installed connector-to-connector length of the fiber optic strands.
   c. Verify through visual inspection of all fiber optic cable termination locations on Drawings, the integrity of the workmanship and the operability of the fiber optic media.

2. Visually inspect optical fiber jacket materials for qualified electrical testing laboratory certification markings. Inspect cabling terminations in communications equipment rooms

for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568.1.

3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

4. Optical Fiber Cable Tests:
   a. Test instruments must meet or exceed applicable requirements in TIA-568.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
   b. Link End-to-End Attenuation Tests:

      1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in one direction in accordance with TIA-526-14, Method B, One Reference Jumper.
      2) Attenuation test results for backbone links must be less than 2.0 dB. Attenuation test results must be less than those calculated in accordance with equation in TIA-568.1.

5. Contractor Responsibility - The Contractor shall:
   a. Coordinate a meeting with NJOIT personnel to discuss testing procedures, equipment, documentation, etc. to verify to the owner a complete understanding of requirements and schedule.
   b. Complete quality control inspection and testing per this Specification. Provide technicians qualified to operate the test equipment.
   c. Maintain test equipment in current calibration during testing operations.
   d. Notify the Owner 48 hours in advance when work, technicians and equipment are prepared for Acceptance tests and inspections.
   e. Coordinate testing with the Owner beforehand to avoid delays in the Project Schedule

B. Field tests and inspections must be witnessed by .

C. Nonconforming Work:

1. Cables will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective cables and retest.

D. Collect, assemble, and submit test and inspection reports.

1. Data for each measurement must be documented.
2. Data for field quality-control report submittals must be printed in summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from instrument to computer, saved as text files, and printed and submitted.

E. Manufacturer Services:

1. Engage factory-authorized service representative to field tests and inspections.

3.8 MAINTENANCE

A. Software Service Agreement:

1. Technical Support: Beginning at Substantial Completion, verify that software service agreement includes software support for 1 year.
2. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within 1 year from date of Substantial Completion.

3. Upgrade Reports: Prepare report after each update, documenting upgrades installed.

END OF SECTION 271323

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 271513 - COMMUNICATIONS COPPER H

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Category 6 twisted pair cable.
2. Twisted pair cable hardware, including
3. Multiuser telecommunications outlet as
4. Cable management system.
5. Cabling identification products.
6. Grounding provisions for twisted pair cable.
7. Source quality control requirements for twisted pair cable.

1.2 DEFINITIONS

A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

B. EMI: Electromagnetic interference.

C. FTP: Shielded twisted pair.

D. F/FTP: Overall foil screened cable with foil screened twisted pair.

E. F/UTP: Overall foil screened cable with unscreened twisted pair.

F. IDC: Insulation displacement connector.

G. LAN: Local area network.

H. Jack: Also commonly called an "outlet," it is the fixed, female connector.

I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

J. RCDD: Registered Communications Distribution Designer.

K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

M. S/FTP: Overall braid screened cable with foil screened twisted pair.

N. S/UTP: Overall braid screened cable with unscreened twisted pairs.

O. UTP: Unscreened (unshielded) twisted pair.

1.3 COPPER HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.

1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft. and includes the components that extend from the equipment outlets to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Reviewed and stamped by RCDD.

1. System Labeling Schedules:

    a. Electronic copy of labeling schedules, in software and format selected by Owner.
    b. Electronic copy of labeling schedules that are part of cabling and asset identification system of software.

2. Cabling administration Drawings and printouts.
3. Wiring diagrams and installation details of telecommunications equipment, to show location and layout of telecommunications equipment, including the following:

    a. Telecommunications rooms plans and elevations.
    b. Telecommunications pathways.
    c. Telecommunications system access points.
    d. Telecommunications grounding system.
    e. Telecommunications conductor drop locations.
    f. Typical telecommunications details.
    g. Mechanical, electrical, and plumbing systems.

C. Twisted pair cable testing plan.

D. Sustainable Design Submittals:

1. Product Data: For each conductor and cable indicating lead content.

2. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

E. Samples: For telecommunications jacks and plugs,.

F. Field Quality-Control Submittals:

1. Field quality-control reports.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installation supervisor, and field inspector.

B. Product Certificates: For each type of product.

C. Source quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Connecting Blocks: of each type.
2. Cover Plates: of each type.
3. Jacks: of each type.
4. Multiuser Telecommunications Outlet Assemblies: of each type.
5. Patch-Panel Units: of each type.
6. Plugs: of each type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of , who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.11 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:

1. Communications, Plenum Rated:

a. Type CMP complying with UL 1685.
b. Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

2. Communications, Non-Plenum Rated:

a. Type CMR complying with UL 1666.
b. Type CMP or Type CMR in listed plenum or riser communications raceway.
c. Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: or less.
2. Smoke-Developed Index: or less.

C. RoHS compliant.

2.3 CATEGORY 5e TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 5e cable at frequencies up to 100 MHz.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden Inc.
2. CommScope, Inc.
3. General Cable; Prysmian Group North America.
4. Substitutions: or approved equal

C. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables.

D. Conductors: 100-ohm, 24 AWG solid copper.

1. Lead Content: Less than 300 parts per million.

E. Shielding/Screening: .

F. Cable Rating: .

G. Jacket: thermoplastic.

2.4 CATEGORY 6 TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6 cable at frequencies up to 500 MHz.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden Inc.
2. CommScope, Inc.

3. General Cable; Prysmian Group North America.
4. Substitutions: or approved equal

C. Standard: Comply with TIA-568-C.2 for Category 6 cables.

D. Conductors: 100-ohm, 23 AWG solid copper.

1. Lead Content: Less than 300 parts per million.

E. Shielding/Screening:

F. Cable Rating: .

G. Jacket: thermoplastic.

2.5 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden Inc.
2. CommScope, Inc.
3. General Cable; Prysmian Group North America.
4. Substitutions: or approved equal

C. General Requirements for Twisted Pair Cable Hardware:

1. Comply with the performance requirements of .
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

D. Source Limitations:

E. Connecting Blocks:

1. 110-style IDC for Category 5e.
2. 66-style IDC for Category 5e.
3. 110-style IDC for Category 6.
4. Provide blocks for the number of cables terminated on the block, plus percent spare, integral with connector bodies, including plugs and jacks where indicated.

F. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: for each conductor in assigned cables.

G. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
3. Number of Jacks per Field: One for each four-pair.

H. Patch Cords: Factory-made, four-pair cables terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

I. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.
3. Marked to indicate transmission performance.

J. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or cover plate.
3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

K. Cover Plate:

1. port, vertical single gang cover plates designed to mount to single gang wall boxes.
2. Plastic Cover Plate: High-impact plastic. Coordinate color with Section 260533 "Raceway and Boxes for Electrical Systems."
3. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.

a. Flush mounting jacks, positioning the cord at a 45-degree angle.

L. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.6 CABLE MANAGEMENT SYSTEM

A. Description: Computer-based cable management system, with integrated database capabilities.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Telsoft Solutions.
2. iTRACS Corporation.
3. Tripplite.
4. Substitutions: or approved equal

C. Document physical characteristics by recording the network, TIA details, and connections between equipment and cable.

D. Information shall be presented in database view.

1. drawing software shall be used as drawing and schematic plans software.

E. System shall interface with the following testing and recording devices:

1. Direct upload tests from circuit testing instrument into the personal computer.
2. Direct download circuit labeling into labeling printer.

2.7 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.8 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables on reels according to TIA-568-C.1.

C. Factory test twisted pair cables according to TIA-568-C.2.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Routing:

1. Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters. Conceal raceway and cables, except in unfinished spaces.

    a. Install plenum cable in environmental air spaces, including plenum ceilings.
    b. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."

2. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings."

B. Comply with Section 270529 "Hangers and Supports for Communications Systems."

C. Comply with Section 270536 "Cable Trays for Communications Systems."

D. Drawings indicate general arrangement of pathways and fittings.

3.3 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:

1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2. Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM), Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. MUTOA shall not be used as a cross-connect point.
7. Consolidation points may be used only for making a direct connection to equipment outlets:

    a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
    b. Locate consolidation points for twisted-pair cables at least 49 feet from communications equipment room.

8. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
9. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
10. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
11. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
12. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
13. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
14. Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend twisted pair cabling, not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable long not less than in diameter below each feed point.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.5 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

C. Comply with TIA-607-B and NECA/BICSI-607.

D. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

E. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."

1. Administration Class: .
2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA-606-B for level of administration.

C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by the engineer.

B. Tests and Inspections:

1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment, and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

D. Nonconforming Work:

1. End-to-end cabling will be considered defective if it does not pass tests and inspections.
2. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

E. Collect, assemble, and submit test and inspection reports.

F. Manufacturer Services:

1. Engage factory-authorized service representative to field tests and inspections.

3.8 MAINTENANCE

A. Software Service Agreement:

1. Technical Support: Beginning at Substantial Completion, verify that software service agreement includes software support for years.
2. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within 1 year from date of Substantial Completion.

3. Upgrade Reports: Prepare report after each update, documenting upgrades installed.

END OF SECTION 271513

A1349-00 INTERIOR CONSTRUCTION, RENOVATION

SECTION 272133 - DATA COMMUNICATIONS WIREI

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes Wireless Access Point jacks.

B. Related Requirements:
1. Section 283100 "Intrusion Detection" tc detection.

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

1.2 DEFINITIONS

A. AES Advanced Encryption Standard

B. ANSI American National Standards Institute

C. BICSI Building Industry Consulting Service International

D. BNIA Buffalo-Niagara International Airport

E. EIA Electronics Industries Alliance

F. IDF Intermediate Distribution Frame

G. IEEE Institute of Electrical and Electronics Engineers

H. LAN Local Area Network

I. MCR Main Communications Room

J. NECA National Electrical Contractors Association

K. NEMA National Electric Manufacturers Association

L. NFPA National Fire Protection Association

M. OAR Owner's Authorized Representative

N. RCDD Registered Communications Distribution Designer

O. RFP Request for Proposal

P. SSID Service Set Identifier

Q. STD Standard

R. TIA Telecommunications Industry Association

S. TKIP Temporal Key Integrity Protocol

T. UL Underwriters Laboratories

U. WAP Wireless Access Point.

V. WLAN Wireless Local Area Network

1.3 ACTION SUBMITTALS

A. Product Data: Product data consisting of manufacturers specifications for each type of product to be installed, all applicable certifications and elevation/plan documents supporting compliance with stated Specifications.

B. Shop Drawings: For Wireless Access Point jacks. Include plans, elevations, sections, details, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for cameras, camera-supporting equipment, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

C. Product Warranty: Sample of special warranty.

D. 3-year minimum warranty and maintenance on all hardware and software with NBD (Next Business Day) service and 1 year on labor.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

B. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

C. Warranty Documentation:

   1. Manufacturers' special warranties.
   2. Installer's special warranties.

D. Software and Firmware Operational Documentation:

1. Software operating manuals.
2. Program Software Backup: On .
3. Device address list.
4. Printout of software application and USB graphic screens.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: years from date of Substantial Completion.

PART 2 - PRODUCTS (PROCURED BY OWNER, INSTALLED BY CONTRACTOR)

2.1 SYSTEM REQUIREMENTS

A. For New Construction projects, it is the responsibility of the consultant to provide wireless and heat maps for the placement of Wireless Access Point locations. It is mandatory to provide 100% wireless building coverage in 2.4 GHz and 5 GHz spectrums in all designs. Wireless WAO locations shall be cabled using a square cell topology. Provision for a Wireless Access Point location every 30-feet (900ft2). Provision for one Wireless Access Point (WAP) for every 20 people (50-60 devices) based on occupancy rate of the area.

B. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.
   1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
   2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" as recommended by manufacturer for type of line being protected.

C. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.2 SPECIAL REQUIREMENTS

D. DPM&C will purchase x number of wireless access points based on the heat map study.

E. Each wireless access point will require two Category 6 cables to be installed from the IDF Category 6 110 panel on each floor.

F. One cable will be for the ethernet port, and the other is for the console port on the wireless access point.

G. The Category 6 cables will be terminated in the ceiling in a two-port surface block with RJ45 jacks and terminated on Category 6 110 panels in each IDF.

H. The data contractor will install the wireless access points and provide and install the Category 6 patch cords from the two-port surface block to the ethernet and console ports on the wireless access point.

I. The ports on the surface block and the 110 panels will be labeled accordingly.

J. The OIT LAN Group will install the Category 6 patch cables from the Category 6 110 panel to the Ethernet switches.

K. The OIT LAN Group will configure and install the network switches.

L. To determine the number of Ethernet switches that are needed, we need the number of devices that will connect to the network switches in the MDF and each IDF.
1. Staff PC/VOIP Phones
2. Staff Network Printers if any
3. PC/VOIP Phone in Conference rooms
4. Network Printers
5. A/V Equipment
6. Wireless Access Points
7. Building Access
8. Video Surveillance
9. Other

2.3 WIRELESS ACCESS POINTS

A. Refer to Contract drawing CS500, CS501, CS502, CS503, and CS504 for full Communication Systems equipment including Wireless Access Points procured by Owner.

2.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Video surveillance system shall withstand the effects of earthquake motions determined according to.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NECA 1.

D. Comply with NFPA 70.

E. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

B. Examine roughing-in for LAN, WAN, and IP network before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRING

A. Wiring Method: Install cables in raceways unless otherwise indicated.
   1. Except raceways are not required in accessible indoor ceiling spaces and attics.
   2. Except raceways are not required in hollow gypsum board partitions.
   3. Conceal raceways and wiring except in unfinished spaces.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

C. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

D. For communication wiring, comply with the following:
   1. Section 271313 "Communications Copper Backbone Cabling."
   2. Section 271513 "Communications Copper Horizontal Cabling."

E. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:
   1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
   2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:
      a. Prepare equipment list described in "Informational Submittals" Article.
      b. Verify operation of auto-iris lenses.

c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
e. Set and name all preset positions; consult Owner's personnel.
f. Set sensitivity of motion detection.
g. Connect and verify responses to alarms.
h. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

E. Video surveillance system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to 2 visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:
1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
5. Provide a written report of adjustments and recommendations.

3.5 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.6 DEMONSTRATION

A. Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION 272133

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 274116 - INTEGRATED AUDIO-VIDEO S

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. A/V System equipment.

B. Related Requirements:

   1. Section

1.2 DEFINITIONS

A. ANSI: American National Standards Institute

B. AV: Audio Video

C. BYOD: Bring Your Own Device

D. DVI: Digital Visual Interface

E. EDID: Extended Display Identification Data

F. HDMI: High-Definition Multimedia Interface

G. IEEE: Institute of Electrical and Electronic Engineers

H. IDF: Intermediate Distribution Frame

I. IO: Input Output

J. MDF: Main Distribution Frame

K. NEC: National Electric Code

L. NEMA: National Electrical Manufacturers Association

M. NFPA: National Fire Protection Association

N. OFE: Owner Furnished Equipment

O. RCDD: Registered Communications Distribution Designer

P. TIA: Telecommunications Industry Standard

Q. USB: Universal Serial Bus

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on Drawings. Test and evaluation data presented in Product Data shall comply with SIA BIO-01.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Diagrams for cable management system.
2. System labeling schedules, including electronic copy of labeling schedules that are part of the cable and asset identification system of the software specified in Parts 2 and 3.
3. Wiring Diagrams. For power, signal, and control wiring. Show typical wiring schematics including the following:

    a. Workstation outlets, jacks, and jack assemblies.
    b. Patch cords.
    c. Patch panels.

4. Cable Administration Drawings: As specified in "Identification" Article.
5. Battery and charger calculations for central station, workstations, and controllers.

C. Product Schedules.

D. Samples: For workstation outlets, jacks, jack assemblies, and faceplates. For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For security system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on media of the hard-copy submittal.
2. System installation and setup guides with data forms to plan and record options and setup decisions.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Credential card blanks, ready for printing. Include enough credential cards for all personnel to be enrolled at the site plus an extra percent for future use.
2. Fuses of all kinds, power and electronic, equal to percent of amount installed for each size used, but no fewer than three units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Cable installer must have on staff an RCDD certified by Building Industry Consulting Service International.

B. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source from single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 deg F, and not more than 80 percent relative humidity, noncondensing.

B. Open each container; verify contents against packing list; and file copy of packing list, complete with container identification, for inclusion in operation and maintenance data.

C. Mark packing list with the same designations assigned to materials and equipment for recording in the system labeling schedules that are generated by software specified in "Cable and Asset Management Software" Article.

D. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient conditions of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
2. Indoor, Controlled Environment: NEMA 250, Type 1 enclosure. System components, except the central-station control unit, installed in indoor environments shall be rated for continuous operation in ambient conditions of dry bulb and 20 to 90 percent relative humidity, noncondensing.
3. Indoor, Uncontrolled Environment: NEMA 250, enclosures. System components installed in indoor environments shall be rated for continuous operation in ambient conditions of dry bulb and 20 to 90 percent relative humidity, noncondensing.

PART 2 - PRODUCTS (PROCURED BY OWNER, INSTALLED BY CONTRACTOR)

2.1 QUALITY OF MATERIALS AND EQUIPMENT

A. All materials and equipment supplied by the Contractor shall be new and shall meet or exceed the latest published specification of the manufacturer in all respects.

B. The Contractor shall supply the latest model available at the time of order placement for each piece of equipment.

C. All equipment shall be UL listed, or equivalent.

2.2 AV SYSTEM EQUIPMENT

A. Refer to Contract drawing CS613 for full AV System part numbers procured by Owner.

2.3 CABLE APPLICATION

A. Comply with TIA 569-D, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. TIA 232-F Cabling: Install at a maximum distance of 50 ft. between terminations.

D. TIA 485-A Cabling: Install at a maximum distance of 4000 ft. between terminations.

E. Card Readers and Keypads:

1. Install number of conductor pairs recommended by manufacturer for the functions specified.
2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from controller to the reader is 250 ft., and install No. 20 AWG wire if maximum distance is 500 ft..
3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the controller.
4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.

F. Install minimum No. 16 AWG cable from controller to electrically powered locks. Do not exceed between terminations.

G. Install minimum No. 18 AWG ac power wire from transformer to controller, with a maximum distance of between terminations.

2.4 GROUNDING

A. Comply with Section 270526 "Grounding and Bonding for Communications Systems."

B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.
3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

2.5 INSTALLATION

A. General

1. Installation shall include the delivery to the installation site, unloading, setting in place, fastening to walls, floors, ceilings, counters, or other structures where required, interconnecting wiring of the system components, equipment alignment and adjustment, programming and configuration and all other work whether or not expressly required herein which is necessary to result in complete and fully operational systems.
2. Prior to ordering equipment, the contractor shall coordinate the frequencies of all wireless devices to prevent unwanted interaction between devices and rooms. This includes, but is not limited to, wireless microphones, assisted listening system devices, wireless control panels, etc.
3. All accessories, including rack mounting hardware, power supplies, etc., shall be obtained from the original equipment manufacturer. Unless otherwise noted or specified, third party accessories shall not be used.
4. All installation practices shall be in accordance with, but not limited to, these specifications and AV Contract drawings. Installation shall be performed in accordance with the applicable standards, requirements, and recommendations of National, State, and Local authorities having jurisdiction.
5. If, in the opinion of the Contractor, an installation practice is desired or required, which is contrary to these specifications or AV Contract drawings, a written request for modification shall be made to the Design Team. Modifications shall not commence without written approval from the Design Team
6. During the installation, and up to the date of final acceptance, the Contractor shall be under obligation to protect his finished and unfinished work against damage and loss. In the event of such damage or loss, the damage shall be replaced or repaired at no cost to the Owner.

B. Physical Installation

1. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise.
2. All equipment shall have an engraved plaque permanently affixed, denoting its function.
3. Fastenings and supports shall be adequate to support their loads with a safety factor as per AHJ. All boxes, equipment, etc., shall be secured plumb and square.
4. Projectors, lenses, and mirrors shall be solidly mounted and braced or isolated, so that there is no observable movement in the image induced by motor vibration or other mechanical operations at the intended minimum viewing distance.
5. In the installation of equipment and cable, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.
6. All overhead equipment must have security cables attached to the building structure to assist in the prevention of loss as required by building code.

C. Finishes, Trim and Escutcheon Components
1. To insure a proper finished appearance, the AV Contractor shall furnish and install trim/escutcheon components at all conditions where A/V components pass through the finished ceilings. This would include but not be limited to video projector supports, television monitor/receiver supports and any other component which is not specifically supplied with integral flanges/trim components, i.e. speaker mounts, assistance listening devices, etc.
2. The visible component of any trim should be minimal in size, preferably no wider than 1/2". All trim components at the ceiling plane shall be finished to match the approved ceiling finish. The audiovisual contractor should obtain a sample from the General Contractor, including any custom color information, or standard color numbers.
3. All visible components and finish options shall be submitted to the Design Team for review and approval prior to fabrication.

D. Raceway Systems and Cable Installation
1. All Cable must be Shielded, all connectors must be shielded and as per Audiovisual Systems Equipment manufacturers' specifications.
2. All wire bundles are to be neat and combed free of cable crossovers.
3. All cables, regardless of length, shall be marked with a permanent, self-laminating wrap-around number or letter cable marker at both ends, similar to the Panduit "Pan- Code" system. Labels must be computer-generated for legibility. Wire labels done by hand in the field must be replaced with computer generated labels. There shall be no unmarked cables at any place in the system. Marking codes used on cables shall correspond to codes shown on shop/installation drawings and or run sheets.
4. All cables shall be grouped according to the signals being carried. In order to reduce signal contamination, separate groups shall be formed for the following cable families:
    a. Power cables
    b. Control cables
    c. Video cables
    d. Audio cables carrying signals less than – 20 dBm
    e. Audio cables carrying signals between – 20 dBm and +20 dBm
    f. Audio cables carrying signals above +20 dBm
5. As a general practice, all power cables, control cables, and high-level cables shall be run on the left side of an equipment rack as viewed from the rear. All other cables shall be run on the right side of an equipment rack, as viewed from the rear.
6. Cables ties shall be placed at appropriate intervals of no greater than six inches for vertical bundles, two inches for horizontal bundles.
7. All vertical cable bundles shall be attached to the rack frame.

8. All cables shall be continuous lengths without splices. All system wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. Except where noted otherwise in the specifications, NO BARE WIRE TERMINATIONS WILL BE ACCEPTED. Heat-shrink tubing shall be used to insulate the ground or drain wire. Unused wires at the end of a cable shall remain unstripped and shall be laid back and held in place with wire ties.
9. All solder connections shall be made with rosin-core solder using temperature- controlled solder stations. Care shall be taken to avoid cold or cracked solder joints. Any connections that do not appear to be clean and shiny, or which show signs of cracking, shall be re-soldered by the contractor before final acceptance of the system.
10. Mechanical connections using insulated, crimp-type connectors shall be bonded to the connector by soldering the wire to the metal part of the connector.
11. Connections made with screw actuated pressure type terminal strips shall be made by stripping approximately 1/4 inch of insulation from the stranded conductor. Then the un-tinned wire shall be inserted into the terminal and the screw tightened using a secure fitting precision screwdriver.
12. 12). Terminal blocks, boards, strips or connectors shall be furnished for all cables which interface with racks, cabinets, consoles, or equipment modules. No audio cables shall run directly to the audio patch panel jacks. Each audio patch panel shall be furnished with an audio terminal block, and all audio cables to and from the audio patch panel shall terminate on this block.
13. All wire markers shall face a common direction.
14. All cables shall have proper connector housing.
15. Cables shall not protrude from the back of racks.
16. All cable entry shall be through the tops of racks or through entrance holes in the base of the rack. No cable shall enter racks through front, rear or side panel openings.
17. All cables that can be terminated in the field (except video and pulse cables, which must be cut to an electrical length) shall be cut to the length dictated by the run. No splices shall be permitted in any pull boxes without prior permission of the Consultant. For equipment mounted on casters, in drawers or on slides, the interconnecting cables shall be provided with a service loop of appropriate length.
18. No cable shall be installed with a bend radius less than that recommended by the cable manufacturer.
19. Where cables are visible, the cables will be sheathed in a color wrap that has been submitted for approval by the Design Team.

E. Connection Plate Receptacles unless otherwise specified
1. Audio (microphone or line level) – XLR type.
2. Audio (loudspeaker level) – Neutrik Speakon®.
3. RF – “F” type. Receptacles shall be insulated from panel type.
4. HDMI – HDMI with locking nut.
5. USB – USB Type A
6. Category 5/6 – RJ45 Type (Shielded)
   Note: All connectors on wall plates, or in other exposed locations, are to be recessed.

F. Patch Panel Assignments
1. All patch panels shall be wired so that signal “sources” (outputs from) appear on the upper row of a row pair; and all “loads” (inputs to) appear on the lower row of a row pair.

G. Patch Panel Designation Strips

1. All audio and video patch panel designation trips shall utilize alphanumeric identifications and descriptive information. The jack position in each horizontal row shall be numbered sequentially from left to right. The horizontal jack rows shall be lettered sequentially from top to bottom. The alphanumeric identification of each jack shall be included on the functional block drawings, as well as on reproductions of these drawings, which shall be mounted in an appropriate location near the patch bays.

H. Maintaining Ground Integrity
1. In order to minimize problems resulting from improper grounding, and to achieve maximum signal- to-noise ratios, the following grounding practices shall be adhered to in order to maintain the integrity of the grounding system:
   a. General
      1) Because of the great number of possible variations in grounding systems, it shall be the responsibility of the Contractor to follow good engineering practice, as outlined below, and to deviate from these practices only when necessary to minimize crosstalk, ground loops, ground-induced noise, and to maximize signal-to-noise ratios in the audio, video, and control systems.
      2) System Power Ground: A single primary "system ground" shall be established for the system in each particular area. All grounding conductors in that area shall connect to this primary system ground.
      3) The system ground shall be provided at the audio equipment rack for the area and shall consist of a copper bar of sufficient size to accommodate all secondary ground conductors. A copper conductor having a maximum of 0.1 Ohms total resistance shall connect the primary system ground bar to the nearest approved ground. The Contractor shall be responsible for determining if the metallic conduit is properly electrically bonded to the building ground system.
      4) Secondary system grounding conductors shall be provided between all racks, audio consoles, and audiovisual system equipment local to the area. Each of these grounding conductors shall have a maximum of 0.1 Ohms total resistance.
      5) Under no conditions shall the AC neutral conductor, either in the power panel or in a receptacle outlet, be used as a system ground, except as specifically defined by NFPA 70 for bonding.
      6) Ungrounded equipment with either an inline transformer or a 2-prong plug, shall be bonded to the rack bus bar using #12awg cable.
   b. Audio Cable Shields
      1) All audio cable shields shall be grounded at one point only. There are no exceptions. For inter and intra-rack wiring, this requires that the shield be connected at one end only. For ungrounded portable equipment, such as microphones, the shield shall be connected at both ends but grounded at only one end.
   c. Video Receptacles
      1) All video receptacles that are provided and installed by the Contractor shall be insulated from the mounting panel, outlet box, or wireway. Unless otherwise detailed herein, this shall be accomplished by using insulated-from-panel type receptacles.
   d. Audio Receptacles
      1) All audio receptacles that are provided and installed by the Contractor shall be insulated from the mounting panel, outlet box, or wireway. Unless

otherwise detailed herein, this shall be accomplished by using insulated-from-panel type receptacles.

2.6 GENERAL SYSTEM PERFORMANCE STANDARDS

A. Unless restricted by the published specifications of a particular piece of equipment, or unless otherwise required under the Detailed Specifications, the following performance standards shall be met by each system. The signal paths for the above Performance Standards shall be as follows: From all source inputs to all signal destinations. See Contractor System Checkout 3.19 for testing procedures.

1. Analog Audio
   a. Frequency Response:.....Within plus or minus 0.5dB, 20 Hz to 20,000 Hz
   b. Signal to Noise Ratio:.....greater than 90dB (Including crosstalk and hum at all Input/Output levels)
   c. Total Harmonic Distortion:.....0.05% maximum from 20 Hz to 20,000Hz.
   d. Input Levels:
      a) Microphone (Nominal):.....-50dbu
      b) Overload (Minimum gain):.....-5dbu
      c) Maximum Gain:.....-26dbu
      d) Line (Nominal):..... +4dbu
      e) Overload (Minimum gain):..... +24dbu
      f) Maximum Gain:.....+9dbu
      g) Input Common Mode Rejection:.....>100db
      h) Output Levels Line (Nominal):.....+4dbu
      i) Maximum:.....+24dbu
      j) Output Impedance:.....
      k) 150 Ohms
2. Analog Video (signal)
   a. Frequency Response:.....Within plus or minus 0.5dB, DC to 4.2 MHz
   b. Signal to Noise Ratio:.....55 dB minimum (peak to RMS) unweighted, DC to 4.2 MHz
   c. Crosstalk:.....45 dB minimum unweighted DC to 4.2 MHz
   d. Line and Field Tilt:.....2% maximum
   e. Differential Gain:.....3% maximum
   f. Differential Gain:.....2 degrees maximum
      1) SDI – Per SMPTE 259M
      2) HD SDI – Per SMPTE 292M
      3) HD SDI (Dual Link) – Per SMPTE 424M
      4) 3G SDI – Per SMPTE 424M
      5) HDMI – Per HDMI Ver. 2.0
      6) HDCP – per HDCP2.2

7) Audio Video Bridging (AVB)
   a) IEEE 802.1AS: Timing and Synchronization for Time-Sensitive Applications
   b) IEEE 802.1Qat: Stream Reservation Protocol (SRP)
   c) IEEE 802.1Qav: Forwarding and Queuing for Time-Sensitive Streams
   d) IEEE 802.1BA: Audio Video Bridging Systems

2.7 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Section 270553 "Identification for Communications Systems" and with TIA 606-B.

B. Using software specified in "Cable and Asset Management Software" Article, develop cable administration drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with the same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

D. At completion, cable and asset management software shall reflect as-built conditions.

2.8 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved. Assign software license to Owner.

2.9 PROGRAMMING

A. General: The description of the control system programming given here serves as a basis for the control system programming. Touch screen layouts and function shall not be limited to the operations outlined in this description.
   1. The AV Consultant and Owner or Owner's Representative shall approve the touch screen layouts and programming flow before programming of the system begins. AV contractor may want to schedule a conference call between AV Consultant and Owner to discuss touch screen operation prior to developing page layouts. The touch screen page layouts and age relationship diagram, with a written button-by-button description of the function of each button, shall be provided to and reviewed with the AV Consultant and Owner or Owner's Representative by the programmer of the control system. It is expected that this

approval meeting could take up to a minimum of one day. The AV contractor shall coordinate this meeting.

2. The AV Consultant and Owner or Owner's Representative shall approve the touch screen layouts and programming flow before programming of the system begins. AV contractor may want to schedule a conference call between AV Consultant and Owner to discuss touch screen operation prior to developing page layouts. The touch screen page layouts and page relationship diagram, with a written button-by-button description of the function of each button, shall be provided to and reviewed with the AV Consultant and Owner or Owner's Representative by the programmer of the control system. It is expected that this approval meeting could take up to a minimum of one day. The AV contractor shall coordinate this meeting.
3. It is the responsibility of the AV contractor to pursue delivery of any software revisions including initiation of related discussions with Owner designees. At the follow up meeting, the customer may make changes to color schemes, button locations, and the existing programmed operations, whether manual or automated, that may be necessary for the proper functioning of the system as outlined in the system description and/or for the ease of the operation by a novice user. These additional operations and changes within the 90-day period after the completion of the last courtroom are to be programmed without additional charge to the customer.
4. The control system introduction page shall be designed in a "system operation wizard" format. The page shall ask user intended use of room to set room to preconfigured settings (e.g., "Will you be making a phone call" resulting in turning on the audio system and landing at phone dialing page.). These various operational modes shall be determined by the user in collaboration with system programmer at initial meeting.
5. The control system shall automate power and power sequencing. Pressing button "system on" shall power up devices in sequence. Pressing button "system off" shall be followed by a confirmation page to confirm system to turn off in sequence.
6. The control system shall route video and audio sources to video and audio outputs. Owner representative shall determine which sources and outputs shall be available on touch screen.
7. Control presets such as levels of lights, program volume, individual audio source volumes, etc. Microphone volumes shall be independently controlled on a subpage.
8. The control panels should be intuitive and allow control of any source device available with a minimum of button presses. The panel should visually indicate the current operation of the sources controlled. The control panels should automatically provide a preview of the picture of the source device being controlled. The panel should indicate audio levels for program and voice and indicate current lighting preset.
9. The control system shall be capable of reporting feedback from all devices in a system to monitoring software. The Owner will determine which feedback information is required.
10. Final layout of project information page must be approved by Owner. Only Owner graphics and Owner information will be allowed on welcome page (splash page).
11. The AV contractor shall provide memory expansion for control processors as required to support system operation.
12. The AV contractor shall provide E-Control and iPad Control pages for all touch screens and shall be accessible on Owner's network.
13. The AV contractor shall determine with the Owner and AV Consultant any control pages and/or functions that require passwords.

B. Video Preview Functionality:
   1. Where specified and components permit, a video preview function shall be provided on the touch screen.

2. The video preview function shall be capable of using IP video streams.
3. The video preview function shall allow any video source selected for output also routed to video preview window on the touch screen.
4. Touching the video preview window on the touch screen shall toggle the video display between a predetermined sized video window and full screen display on the touch screen.
5. Control buttons for the selected video source shall always be present below the video preview window and/or transparently overlaid onto the full screen display.
6. Preview function shall be accessible during event operation without interrupting main displays and audio reinforcement system.
7. Pressing the video source button followed by pressing the video display button shall route source to the respective displays.

2.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use tester approved for type and kind of installed cable. Test for faulty connectors, splices, and terminations. Test according to TIA 568-C.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for balanced twisted-pair cables must comply with minimum criteria in TIA 568-C.1.
2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Devices and circuits will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

2.11 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup check according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.

2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

2.12 DEMONSTRATION

A. Owner's maintenance personnel to adjust, operate, and maintain security access system. See Section 017900 "Demonstration and Training."

B. Develop separate training modules for the following:

1. Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.
2. Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.
3. Security personnel.
4. Hardware maintenance personnel.
5. Corporate management.

END OF SECTION 274116

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 275123.20 - COMMERCIAL INTERCOMM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes intercommunications and pro

1. IP Video Intercom System equipment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For intercommunications and program systems.

1. Include plans, elevations, sections, and details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include scaled drawings for master station that detail built-in equipment.
4. Include diagrams for power, signal, and control wiring.

a. Identify terminals to facilitate installation, operation, and maintenance.
b. Single-line diagram showing interconnection of components.
c. Cabling diagram showing cable routing.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including luminaires, diffusers, grilles, speakers, sprinklers, access panels, and special moldings are shown and coordinated with each other, using input from installers of the items involved.
2. Elevation drawings, drawn to scale, on which wall-mounted items including luminaires, intercommunications components, windows, doors, access panels, wall finishes, trims, piping, and conduit are shown and coordinated with each other, using input from installers of the items involved.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For intercommunications and program systems to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

    a. A record of Owner's equipment-programming option decisions.
    b. Plans, drawn to scale, indicating location, designation, and connection of intercommunications system components.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified agency, with the experience and capability to conduct testing indicated.

1. Testing Agency's Field Supervisor: Certified by NICET as Audio Systems Technician.

1.6 COORDINATION

A. Coordinate layout and installation of ceiling-mounted speaker microphones with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS (PROCURED BY OWNER, INSTALLED BY CONTRACTOR)

2.1 IP VIDEO INTERCOM SYSTEM EQUIPMENT

A. Refer to Contract drawing CS607 for full IP Video System part numbers procured by Owner.

2.2 SOFTWARE AND LICENSING:

A. Manufacturers: Provided by the Owner.

1. Stentofon; a brand of Zenitel USA provided by the Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Shall be installed by qualified technicians who have been factory trained and certified.

B. Wiring shall be uniform and in accordance with national electric codes and manufacturers' instructions.

C. Equipment shall be firmly secured, plumb, and level.

D. All cable runs at the main terminal board and in all connection, boxes shall be tagged and identified.

E. Coordinate all work with other effected trades and contractors.

F. Product shall be configured in accordance with manufacturer-supplied hardening guide. Systems for which the manufacturer does not provide a hardened installation option are not acceptable.

G. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

H. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.

I. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.

3.2 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

3.3 SYSTEM PROGRAMMING

A. System shall include all software necessary for system configuration.

B. System shall be turned on and adjustments made to meet requirements of specifications and on-site conditions.

C. System shall be programmed to function as specified.

D. Directory numbers, feature codes, and special programming shall be documented, printed and made available to owner.

E. Programming: Fully brief Owner on available programming options. Record Owner's decisions and set up initial system program. Prepare a written record of decisions, implementation methodology, and final results.

3.4 SYSTEM DESCRIPTION

A. The purpose of the SECURITY COMMUNICATION SYSTEM shall be to provide fast “duplex,” (hands-free at both ends) voice communication as required to provide instant intercommunications for employees and visitors, emergency paging and signaling, alarm distribution, audio program distribution and active noise cancellation for high noise environments. System shall assist with personnel safety, facility security, security systems integration, operational efficiency and maintenance functions..

B. The system shall be a microprocessor-controlled system running embedded real time Linux version 4.14 which is a long-term support version with cybersecurity patches, fully "digital", PC programmable, intelligent communication gateway with HD audio server. The system shall be capable of automatic “duplex,” hands-free operation, without the use of handsets, at both the initiating and receiving station. The audio server shall include 2 Ethernet IP ports which can support protocols IP v4, TCP, UDP, SSH, NTP, HTTP 1.1, Syslog, SNMP v2c, SIP, RTP, RTCP, and VoIP AlphaNet for direct transfer of call processing functions to and from other ICX-500’s as well as to external microprocessor-controlled equipment such as access control, CCTV switchers, remote control boards and audio amplifiers. The audio server shall support the mix of IP stations with integrated active noise cancellation as desired. The audio server shall support SIP protocol to allow for interfacing to VoIP telephones and or systems and equipment. The system shall provide special features such as the capability of redundancy via IP, wideband audio (7kHz), built in firewall, integrated web & SIP server as well as low latency switching. The audio server shall allow for remote programming, logging and maintenance via IP using AlphaPro as well as additional maintenance and statistical information via IP using web browser to interface to ICX Web. The ICX-500 audio server shall have the capability (thru software licensing) for unlimited customer specific messages that can be used for evacuation or emergency events. Hardware recovery via SD card capability. Software integrity check via SHA256 and hardware root of trust for IP security. 1048 MB SDRAM, 1048 MB NAND Flash and 128 MB NOR Flash. System capable of 60,000 BHCA.

C. Integration: Coordinate features and select components to form an integrated system. Match components and interconnections for optimum performance of specified functions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

3.5 SYSTEM TEST PROCEDURES

A. System shall be completely tested to assure that the Intelligent Communication Gateway with HD Audio and all components, stations, speakers, and accessories are hooked-up and in working order.

B. System shall be pre-tested by contractor and certified to function in accordance with plans and specifications.

C. System shall be tested in presence of owner's representative.

3.6 OWNERS INSTRUCTIONS

A. Contractor shall conduct up to (4) hours of instruction in use and operation of the system to designated owner representatives, within (30) days of system acceptance. Owner will print and distribute directory number plan to users.

B. Contractor shall conduct up to (4) hours of technical training, in programming, troubleshooting, and service of the system, to designated owner representatives within (90) days of system acceptance.

C. Manufacturer shall conduct periodic technical training seminars and make them available to those responsible for on-going maintenance of the system.

3.7 STARTUP SERVICE

A. startup service.

1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.
2. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.

B. Occupancy Adjustments: When requested within months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to visits to Project during other-than-normal occupancy hours for this purpose.

3.9 DEMONSTRATION

A. Owner's maintenance personnel to adjust, operate, and maintain the intercommunications and program systems.

1. Train Owner's maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining the system and equipment.

END OF SECTION 275123.20

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 280528.33 - CONDUITS AND BACK SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Conduit and tubing.
2. Surface raceways.
3. Wireways.
4. Outlet boxes.
5. Pull and junction boxes.
6. Handholes.

B. Related Requirements:

1. Section 078400 - Firestopping: Product requirements for firestopping for placement by this Section.
2. Section 260526 - Grounding and Bonding for Electrical Systems: Grounding and bonding of raceway and boxes.
3. Section 260533 - Raceway and Boxes for Electrical Systems: Product and installation requirements for raceway and pull boxes.
4. Section 262726 - Wiring Devices: Wall plates for finished areas, and orientation of boxes to accommodate wiring devices.
5. Section 280528.33 - Conduits and Backboxes for Electronic Safety and Security
6. Section 280553 - Identification for Electronic Safety and Security: Identification of raceway and boxes.

1.2 REFERENCE STANDARDS

A. American National Standards Institute:

1. ANSI C80.1 - American National Standard for Electric Rigid Steel Conduit (ERSC).
2. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT).
3. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC).

B. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA FB 1 - Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing (EMT) and Cable.
3. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit (IMC).

6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
7. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate installation of outlet boxes.

C. Coordinate mounting heights, orientation, and locations of outlets mounted above counters, benches, and backsplashes.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit manufacturer's information pertaining to following items:

a. Liquidtight flexible metal conduit.
b. Nonmetallic conduit.
c. Flexible nonmetallic conduit.
d. Nonmetallic tubing.
e. Raceway fittings.
f. Conduit bodies.
g. Surface raceway.
h. Wireway.
i. Pull and junction boxes.
j. Handholes.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

E. Qualifications Statement:

1. Submit qualifications for manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Record actual routing of conduits larger than inches.
2. Record actual locations and mounting heights of outlet boxes, pull boxes, and junction boxes.

1.6 QUALITY ASSURANCE

A. Perform Work according to BICSI standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from areas involved in construction operations.
2. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
3. Protect PVC conduit from sunlight.
4. Provide additional protection according to manufacturer instructions.

1.8 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Raceway and Boxes: Locate as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.

B. Underground Conduits Greater Than Feet outside Foundation Wall:
1. Furnish cast-metal boxes or nonmetallic handhole.

C. Underground Conduits within Feet of Foundation Wall:
1. Furnish cast-metal boxes or nonmetallic boxes.

D. Within or under Slab-on-Grade:
1. Boxes: Cast metal or nonmetallic.

E. Outdoor Locations, above Grade:
1. Outlet, Pull, and Junction Boxes: Cast metal or nonmetallic.

F. Within Slab, above Grade:

1. Boxes: Cast metal or nonmetallic.

G. Wet and Damp Locations:
1. Outlet, Pull, and Junction Boxes: Cast metal or nonmetallic.
2. Outlet Boxes in Finished Areas: Flush mounted.

H. Concealed Dry Locations:
1. Boxes: Sheet metal.
2. Outlet Boxes in Finished Areas: Flush mounted.
3. Large Pull Boxes: Hinged enclosure.

I. Exposed Dry Locations:
1. Boxes: Sheet metal.
2. Outlet Boxes in Finished Areas: Flush mounted.
3. Large Pull Boxes: Hinged enclosure.

2.2 PERFORMANCE AND DESIGN CRITERIA

A. Minimum Raceway Size: inch unless otherwise indicated.

2.3 METAL CONDUIT

A. Manufacturers:
1. Appleton
2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Rigid Steel Conduit: Comply with ANSI C80.1.

C. Rigid Aluminum Conduit: Comply with ANSI C80.5.

D. Intermediate Metal Conduit: Rigid steel.

E. Fittings and Conduit Bodies:

1. Comply with NEMA FB 1.
2. Match conduit material.

2.4 PVC-COATED METAL CONDUIT

A. Manufacturers:
1. Appleton
2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Description:

1. Rigid steel conduit with external PVC coating.
2. Comply with NEMA RN 1.
3. Thickness: mils.

C. Fittings and Conduit Bodies:

1. Steel fittings with external PVC coating to match conduit.
2. Comply with NEMA FB 1

2.5 FLEXIBLE METAL CONDUIT

A. Manufacturers:
1. Appleton
2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Description: Interlocked construction.

C. Fittings: Comply with NEMA FB 1.

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:
1. Appleton
2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Description: Interlocked construction with PVC jacket.

C. Fittings: Comply with NEMA FB 1.

2.7 ELECTRICAL METALLIC TUBING

A. Manufacturers:
1. Appleton
2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Description:

1. Galvanized tubing.
2. Comply with ANSI C80.3.

C. Fittings and Conduit Bodies:

1. Material: Steel.

2. Comply with NEMA FB 1.

2.8 NONMETALLIC CONDUIT

A. Manufacturers:
1. Appleton
2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Product Description:

1. Material: Schedule PVC.
2. Comply with NEMA TC 2.

C. Fittings and Conduit Bodies: Comply with NEMA TC 3.

2.9 NONMETALLIC TUBING

A. Manufacturers:
1. Appleton
2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Description: Comply with NEMA TC 2.

C. Fittings and Conduit Bodies: Comply with NEMA TC 3.

2.10 SURFACE METAL RACEWAY

A. Manufacturers:
1. Appleton
2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.

C. Fittings, Boxes, and Extension Rings:

1. Furnish manufacturer's standard accessories.
2. Match finish on raceway.

2.11 SURFACE NONMETAL RACEWAY

A. Manufacturers:
1. Appleton

2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Description: channel with fitted cover, suitable for use as surface raceway.

C. Finishes: enamel paint.

D. Fittings, Boxes, and Extension Rings:

1. Furnish manufacturer's standard accessories.
2. Match finish on raceway.

2.12 WIREWAY

A. Manufacturers:
1. Appleton
2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Description:

C. Size:
1. Length: As indicated on Drawings.

2.13 OUTLET BOXES

A. Manufacturers:
1. Appleton
2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Sheet Metal Outlet Boxes:

1. Material: Galvanized steel.
2. Comply with NEMA OS 1.
3. Luminaire and Equipment Supporting Boxes:

a. Rated for weight of equipment supported.
b. Furnish 1/2-inch male fixture studs where required.

4. Furnish concrete ceiling boxes.

C. Nonmetallic Outlet Boxes: Comply with NEMA OS 2.

D. Cast Boxes:
1. Type: FD.
2. Comply with NEMA FB 1.

3. Furnish gasketed cover by box manufacturer.

E. Wall Plates for Finished Areas: As specified in Section 262726 - Wiring Devices.

F. Wall Plates for Unfinished Areas: Furnish gasketed cover.

2.14 PULL AND JUNCTION BOXES

A. Manufacturers:
1. Appleton
2. Thomas & Betts
3. Atkore Allied Tube & Conduit
4. or Approved Equal

B. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

C. Hinged Enclosures: As specified in Section 262716 - Electrical Cabinets and Enclosures.

D. Surface-Mounted Cast Metal Boxes:
1. Flat flanged.
2. Covers: Furnish with ground flanges, neoprene gaskets, and stainless-steel screws.

E. In-Ground Cast Metal Boxes:
1. Comply with NEMA 250 Type 6.
2. Covers:

a. Type: Recessed, for flush mounting.
b. Furnish neoprene gaskets and stainless-steel screws.

F. Fiberglass Handholes:

1. Construction: Die-molded, glass fiber.
2. Cable Entrance: Precut, 6 inches by 6 inches located at center bottom of each side.
3. Cover: Glass fiber, weatherproof, with non-skid finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Existing Work:

1. Remove exposed abandoned raceway.
2. Cut raceway flush with walls and floors, and patch surfaces.
3. Remove concealed abandoned raceway to its source.
4. Disconnect abandoned outlets and remove devices.
5. Outlets:

a. Remove abandoned outlets if raceway is abandoned and removed.
b. Install blank cover on abandoned outlets not removed.

6. Access:

    a. Maintain access to existing boxes and other installations remaining active and requiring access.
    b. Modify installation or provide access panel.

7. Extend existing raceway and box installations using materials and methods as specified.
8. Cleaning: Clean and repair existing raceway and boxes that are to remain or to be reinstalled.

3.2 INSTALLATION

A. Ground and bond raceway and boxes as specified in Section 260526 - Grounding and Bonding for Electrical Systems.

B. Fasten raceway and box supports to structure and finishes as specified in Section 280528.29 - Hangers and Supports for Electronic Safety and Security.

C. Identify raceway and boxes as specified in Section 280553 - Identification for Electronic Safety and Security.

D. Arrange raceway and boxes to maintain headroom and to present neat appearance.

E. Raceway:

1. As specified in Section 260533 - Raceway and Boxes for Electrical Systems.
2. Routing:

    a. Raceway routing is shown in approximate locations unless dimensioned on Drawings.
    b. Route raceway to complete wiring system.
    c. Route exposed raceway parallel to and perpendicular to walls.
    d. Route raceway installed above accessible ceilings parallel to and perpendicular to walls.

3. Supports:

    a. Arrange raceway supports to prevent misalignment during wiring installation.
    b. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
    c. Do not support raceway with wire or perforated pipe straps.
    d. Remove wire used for temporary supports
    e. Do not attach raceway to ceiling support wires or piping systems.
    f. Construct wireway supports from steel channel specified in Section 280528.29 - Hangers and Supports for Electronic Safety and Security.

4. Racks:

    a. Group related raceway and support using conduit rack.

b. Construct rack using steel channel as specified in Section 280528.29 - Hangers and Supports for Electronic Safety and Security.

5. Conduit:

a. Route conduit in and under slab from point-to-point.
b. Maximum Size Conduit in Slab above Grade: inch.
c. Do not cross conduits in slab.

6. Maintain clearance between raceway and piping for maintenance purposes.
7. Maintain 12-inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
8. Cut conduit square, using saw or pipe cutter, and de-burr cut ends.
9. Bring conduit to shoulder of fittings and fasten securely.
10. Nonmetallic Conduit:

a. Join nonmetallic conduit using cement as recommended by manufacturer.
b. Wipe nonmetallic conduit dry and clean before joining.
c. Apply full even coat of cement to entire area inserted in fitting.
d. Allow joint to cure for minimum 20 minutes.

11. Changes in Direction:

a. Install not more than equivalent of three 90-degree bends between boxes.
b. Install conduit bodies to make sharp changes in direction, as around beams.
c. Use bends in metal conduit larger than 2-inch size.

12. Avoid moisture traps and install junction boxes with drain fitting at low points in conduit system.
13. Install fittings to accommodate expansion and deflection where raceway crosses expansion joints.
14. Install suitable pull string or cord in each empty raceway, except sleeves and nipples.
15. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
16. Surface Raceway:

a. Install flat-head screws, clips, and straps to fasten raceway channel to surfaces.
b. Mount level and plumb.
c. Install insulating bushings and inserts at connections to outlets and corner fittings.

17. Close ends and unused openings in wireway.

F. Boxes:
1. Adjust box location up to feet prior to rough-in to accommodate intended purpose.
2. Orientate boxes to accommodate wiring devices orientated as specified in Section 262726 - Wiring Devices.
3. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
4. Accessible Ceiling Areas: Install outlet and junction boxes not more than 6 inches from ceiling access panel or from removable, recessed luminaire.
5. Flush-Mounted Boxes:

a. Locate flush-mounted boxes in masonry wall, to limit cutting of masonry unit to corner only.
b. Do not install flush-mounted boxes back-to-back in walls.
c. Install flush-mounted boxes with minimum 6-inch separation, and with minimum 24-inch separation in acoustic-rated walls.
d. Secure flush-mounted boxes to interior wall and partition studs, and accurately position to allow for surface finish thickness.
e. Install stamped steel bridges to fasten flush-mounted outlet boxes between studs.
f. Install flush-mounted boxes without damaging wall insulation or reducing insulation effectiveness.

6. Hung Ceiling Outlet Boxes: Install adjustable steel channel fasteners.
7. Do not fasten boxes to ceiling support wires or other piping systems.
8. Support boxes independent of conduit.
9. Gang Boxes:

a. Install gang box if more than one device is to be mounted together.
b. Do not use sectional boxes.
c. Single-Device Outlets: Install gang box with plaster ring.

G. Interface with Other Work:

1. Roofing:

a. Route conduit through roof openings for piping and ductwork, or through suitable roof jack with pitch pocket.
b. Coordinate location with roofing installation as specified in Section.
2. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices.

H. Installation Standards: Install Work according to standards.

3.3 ADJUSTING

A. Adjust flush-mounted outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

3.4 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

END OF SECTION 280528.33

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 280553 - IDENTIFICATION FOR ELECTR

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nameplates.
2. Labels.
3. Wire markers.
4. Conduit markers.

B. Related Requirements:

1. Section 270553 - Identification for Communications Systems: Identification methods for communications equipment and components.

1.2 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit manufacturer's catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

C. Samples:

1. Submit tags, actual size.
2. Submit labels, actual size.

D. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

E. Qualifications Statement:

1. Submit qualifications for manufacturer.

1.3 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of tagged devices, including tag numbers.

1.4 QUALITY ASSURANCE

A. Perform Work according to standards.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store and protect products according to manufacturer instructions.

1.6 AMBIENT CONDITIONS

A. Section 015000 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Install only when ambient temperature and humidity conditions for adhesive are within range as recommended by manufacturer.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Manufacturers:
1. Nadco Tapes and Labels, Inc.
2. CPC Label
3. Dynalab Corp.
4. or Approved Equal

B. Description: Laminated three-layer plastic with engraved letters on contrasting background color.

C. Letter Size:

1. 1/4-inch-high letters for identifying individual equipment and loads.
2. 1/4-inch-high letters for identifying grouped equipment and loads.

D. Minimum Nameplate Thickness: inch.

2.2 LABELS

A. Manufacturers:
1. Nadco Tapes and Labels, Inc.
2. CPC Label
3. Dynalab Corp.
4. or Approved Equal

B. Description:

1. Embossed adhesive tape.
2. Lettering: 1/4-inch white letters on black background.

2.3 WIRE MARKERS

A. Manufacturers:
   1. Nadco Tapes and Labels, Inc.
   2. SmartSign
   3. Colonial Teltek
   4. or Approved Equal

B. Furnish materials according to standards.

C. Legend:

   1. Power and Lighting Circuits: Branch circuit or feeder number.
   2. Control Circuits: Control wire number as indicated on the drawings.

2.4 CONDUIT AND RACEWAY MARKERS

A. Manufacturers:
   1. Nadco Tapes and Labels, Inc.
   2. SmartSign
   3. Colonial Teltek
   4. or Approved Equal

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Existing Work:

   1. Install identification on existing to remain, as specified in this Section.
   2. Install identification on unmarked existing.
   3. Re-stencil existing equipment.

3.2 INSTALLATION

A. Install identifying devices after completion of painting.

B. Nameplates:

   1. Install nameplate parallel to equipment lines.
   2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners or adhesive.
   3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners or adhesive.
   4. Secure nameplate to equipment front using adhesive tape.
   5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.

6. Install nameplates for following:

    a. Panels.

C. Labels:

1. Install label parallel to equipment lines.
2. Install label for identification of individual control device stations as indicate on drawings.
3. Install labels for permanent adhesion.

D. Wire Markers:

1. Install wire marker for each conductor at each load connection.
2. Mark data cabling at each end and install marking at accessible locations along cable run.
3. Install labels at data outlets identifying patch panel and port designation.

E. Markers:

1. Install marker for each longer than feet.
2. Marker Spacing: feet o.c.

F. Underground Warning Tape:

1. Install underground warning tape along length of each underground conduit, raceway, or cable.
2. Burial: 6 to 8 inches below finished grade, and directly above buried conduit, raceway, or cable.

G. Installation Standards: Install Work according to standards.

END OF SECTION 280553

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Device guards.
7. Remote annunciator.
8. Graphic annunciator.
9. Addressable interface device.
10. Digital alarm communicator transmitter.
11. Network communications.
12. System printer.

B. Related Requirements:

1. Division 27 for cable requirements.

1.3 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. HLI: High Level Interface.

D. NICET: National Institute for Certification in Engineering Technologies.

E. PC: Personal computer.

F. VESDA: Very Early Smoke-Detection Apparatus.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.

1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
    a. Show field wiring required for HVAC unit shutdown on alarm.
    b. Locate detectors according to manufacturer's written recommendations.
12. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

    a. Trained and certified by manufacturer in fire-alarm system design.
    b. NICET-certified, fire-alarm technician; Level III minimum.

D. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.

2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.6 Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:

a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
d. Riser diagram.
e. Device addresses.
f. Record copy of site-specific software.
g. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.

4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

h. Manufacturer's required maintenance related to system warranty requirements.
i. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than two.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than two.
3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than two of each type.
4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than two of each type.
5. Keys and Tools: One extra set for access to locked or tamperproofed components.
6. Audible and Visual Notification Appliances: Quantity equal to 10 percent of amount installed, but no fewer than two.
7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

B. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. UL-certified addressable system, with multiplexed signal transmission and voice/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Automatic sprinkler system water flow.
6. Fire pump running.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm and specific initiating device at fire-alarm control unit, connected network control panels, and remote annunciators.
3. Transmit an alarm signal to the remote alarm graphic annunciator.
4. Indicate device in alarm on the graphic annunciator
5. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
6. Record events in the system memory.
7. Record events by the system printer.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, or printer interface.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Supervisory Signal Actions:

1. Initiate notification device in the control room.
2. Identify specific device initiating the event at fire-alarm control unit, connected network control panels, and remote annunciators.
3. Record the event on system printer.
4. Display system status on graphic annunciator.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.4 FIRE-ALARM CONTROL UNIT

A. Manufacturer: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Johnson Controls
2. Notifier.
3. Faraday.
4. Fire-Lite Alarms.
5. Bosch Security Systems.
6. Siemens Industry, Inc.; Fire Safety Division.
7. Silent Knight.
8. SimplexGrinnell LP.
9. Or approved equal

B. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.

    a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
    b. Include a real-time clock for time annotation of events on the event recorder and printer.
    c. Provide communication between the FACP and remote annunciators, and displays.
    d. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.

2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1. Pathway Class Designations: NFPA 72, Class B.
2. Pathway Survivability: Level 0.
3. Install no more than 50 addressable devices on each signaling-line circuit.
4. Serial Interfaces:

    a. One dedicated RS 485 port for central-station operation using point ID DACT.
    b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
    c. One RS 232 port for PC configuration.

E. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Sound general alarm if the alarm is verified.
4. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

F. Notification-Appliance Circuit:

1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

G. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided as a special module that is part of fire-alarm control unit.

1. Indicate number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711.

    a. Allow the application of, and evacuation signal to, indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
    b. Programmable tone and message sequence selection.
    c. Standard digitally recorded messages for "Evacuation" and "All Clear."
    d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification-appliance circuits of fire-alarm control unit.

2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

H. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

I. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

J. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed, valve-regulated, recombinant lead acid.

K. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.5 MANUAL FIRE-ALARM BOXES

A. Manufacturer: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Johnson Controls
   2. Notifier.
   3. Faraday.
   4. Fire-Lite Alarms.
   5. Bosch Security Systems.
   6. Siemens Industry, Inc.; Fire Safety Division.
   7. Silent Knight.
   8. SimplexGrinnell LP.

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

   1. Single-action mechanism, key-operated, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
   2. Station Reset: Key- or wrench-operated switch.
   3. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

2.6 SYSTEM SMOKE DETECTORS

A. Manufacturer: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Johnson Controls
   2. Notifier.
   3. Faraday.
   4. Fire-Lite Alarms.
   5. Bosch Security Systems.
   6. Siemens Industry, Inc.; Fire Safety Division.
   7. Silent Knight.
   8. SimplexGrinnell LP.

B. General Requirements for System Smoke Detectors:

   1. Comply with UL 268; operating at 24-V dc, nominal.
   2. Detectors shall be two-wire type.
   3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
   4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
   5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition.

C. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
3. Multi-Sensor Base (Photoelectric with Carbon Monoxide)
4. All detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density. Electrolytic CO Toxic Gas Sensor.
5. Supply CO Addressable Base along with photoelectric sensor with a Piezo Electric Sounder.

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).
    f.

D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.7 HEAT DETECTORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Johnson Controls
   2. Notifier.
   3. Faraday.
   4. Fire-Lite Alarms.
   5. Bosch Security Systems.
   6. Siemens Industry, Inc.; Fire Safety Division.
   7. Silent Knight.
   8. SimplexGrinnell LP.

B. General Requirements for Heat Detectors: Comply with UL 521.

   1. Temperature sensors shall test for and communicate the sensitivity range of the device.

C. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
   1. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

D. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F .
   1. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.8 NOTIFICATION APPLIANCES

A. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Johnson Controls
   2. Notifier.
   3. Faraday.
   4. Fire-Lite Alarms.
   5. Bosch Security Systems.
   6. Siemens Industry, Inc.; Fire Safety Division.
   7. Silent Knight.
   8. SimplexGrinnell LP.

B. General Requirements for Notification Appliances: Individually addressed, connected to a signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.

C. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

E. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.

1. Rated Light Output:
   a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

F. Voice/Tone Notification Appliances:

1. Comply with UL 1480.
2. Speakers for Voice Notification: Locate speakers for voice notification to provide the intelligibility requirements of the "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
3. High-Range Units: Rated 2 to 15 W.
4. Low-Range Units: Rated 1 to 2 W.
5. Mounting: surface mounted.
6. Matching Transformers: Tap range matched to acoustical environment of speaker location.

2.9 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Surface cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.10 ADDRESSABLE INTERFACE DEVICE

A. General:

1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal .

1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.

2.11 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by device manufacturer.
2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before all other trades have completed cleanup shall be replaced.
2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

C. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

D. Smoke- or Heat-Detector Spacing:

1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet .
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A in NFPA 72.
5. HVAC: Locate detectors not closer than 36 inches from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

E. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.

1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

G. Device Location-Indicating Lights: Locate in public space near the device they monitor.

H. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

3.3 PATHWAYS

A. Pathways shall be installed in EMT conduit.

3.4 CONNECTIONS

A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches (910 mm) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
   1. Smoke dampers in air ducts of designated HVAC duct systems.
   2. Supervisory connections at valve supervisory switches.
   3. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
   4. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
   5. Supervisory connections at fire-pump engine control panel.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
    b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.9 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 281300 - ACCESS CONTROL SOFTWARI

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access Control System and Software.

B. Related Requirements:

1. Section 281500 "Access Control System Hardware Devices" for access control system hardware, such as keypads, card readers, and biometric identity devices.

1.2 DEFINITIONS

A. Credential: Data assigned to an entity and used to identify that entity.

B. DTS: Digital Termination Service. A microwave-based, line-of-sight communication provided directly to the end user.

C. Identifier: A credential card; keypad personal identification number; or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

D. Location: A Location on the network having a workstation-to-controller communications link, with additional controllers at the Location connected to the workstation-to-controller link with a TIA 485-A communications loop. Where this term is presented with an initial capital letter, this definition applies.

E. Workstation: Personal computer. Applies to the central station, workstations, and file servers.

F. RAS: Remote access services.

G. RF: Radio frequency.

H. ROM: Read-only memory. ROM data are maintained through losses of power.

I. TCP/IP: Transport control protocol/Internet protocol.

J. TWAIN: Technology without an Interesting Name. A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.

K. WMP: Windows media player.

L. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.

M. WYSIWYG: What You See Is What You Get. Text and graphics appear on the screen the same as they will in print.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on Drawings. Test and evaluation data presented in Product Data shall comply with SIA BIO-01.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Diagrams for cable management system.
2. System labeling schedules, including electronic copy of labeling schedules that are part of the cable and asset identification system of the software specified in Parts 2 and 3.
3. Wiring Diagrams. For power, signal, and control wiring. Show typical wiring schematics including the following:

    a. Workstation outlets, jacks, and jack assemblies.
    b. Patch cords.
    c. Patch panels.

4. Cable Administration Drawings: As specified in "Identification" Article.
5. Battery and charger calculations for central station, workstations, and controllers.

C. Product Schedules.

D. Samples: For workstation outlets, jacks, jack assemblies, and faceplates. For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For security system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Workstation operating system documentation.
2. Workstation installation and operating documentation, manuals, and software for the workstation and all installed peripherals. Software shall include system restore, emergency boot diskettes, and drivers for all installed hardware. Provide separately for each workstation.

3. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on media of the hard-copy submittal.
4. System installation and setup guides with data forms to plan and record options and setup decisions.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Laser Printers: Three toner cassettes and one replacement drum unit.
2. Credential card blanks, ready for printing. Include enough credential cards for all personnel to be enrolled at the site plus an extra percent for future use.
3. Fuses of all kinds, power and electronic, equal to percent of amount installed for each size used, but no fewer than three units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Cable installer must have on staff an RCDD certified by Building Industry Consulting Service International.

B. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source from single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Central Station, Workstations, and Controllers:

1. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 deg F, and not more than 80 percent relative humidity, noncondensing.
2. Open each container; verify contents against packing list; and file copy of packing list, complete with container identification, for inclusion in operation and maintenance data.
3. Mark packing list with the same designations assigned to materials and equipment for recording in the system labeling schedules that are generated by software specified in "Cable and Asset Management Software" Article.
4. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient conditions of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
2. Indoor, Controlled Environment: NEMA 250, Type 1 enclosure. System components, except the central-station control unit, installed in indoor environments shall be rated for continuous operation in ambient conditions of dry bulb and 20 to 90 percent relative humidity, noncondensing.
3. Indoor, Uncontrolled Environment: NEMA 250, enclosures. System components installed in indoor environments shall be rated for continuous operation in ambient conditions of dry bulb and 20 to 90 percent relative humidity, noncondensing.
4. Outdoor Environment: NEMA 250, NEMA 250, enclosures. System components installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation where exposed to rain as specified in NEMA 250, winds up to 85 mph.
5. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
6. Corrosive Environment: For system components subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones, provide NEMA 250, enclosures.

1.10 CONTRACTOR REQUIREMENTS

1. This project is limited to a list of prequalified Contractors (aka Vendors). Therefore, the following Vendors have been pre-qualified to submit a proposal based on their signed agreement to comply with the Terms and Conditions document set forth in the Term Contract T-2424: SURVEILLANCE & ACCESS CONTROL SYSTEMS MAINTENANCE, REPAIR & INSTALLATION SVS., issued August 1, 2017.
   a. A+ Technology & Security Solutions, Inc.
   b. Commercial Technology Contractors, Inc.
   c. Signal Electric Corp.
   d. General Alarm, LLC -Triad Security Systems
   e. Main Access Security System
   f. TDK Systems Group, Inc.
   g. Dynamic Security

PART 2 - PRODUCTS (PROCURED BY OWNER, INSTALLED BY CONTRACTOR)

2.1 ACCESS CONTROL SYSTEM AND SOFTWARE

A. Refer to Contract drawing CS603 for full Access Control System part numbers procured by Owner.

2.2 ACCESS CONTROL SOFTWARE

A. Refer to Contract drawing CS603 for full Access Control System part numbers procured by Owner.

2.3 DESCRIPTION

A. Security Access System: Workstation-based central station and field-installed controllers, connected by a high-speed electronic-data transmission network.

B. System Software: Based on bit, central-station, workstation operating system, server operating system, and application software. Software shall have the following capabilities:

1. Multiuser and multitasking to allow for independent activities and monitoring to occur simultaneously at different workstations.
2. Graphical user interface to show pull-down menus and a menu-tree format that complies with interface guidelines of the operating system.
3. System license for the entire system including capability for future additions that are within the indicated system size limits specified in this Section.
4. Open-architecture system that allows importing and exporting of data and interfacing with other systems that are compatible with operating system.
5. Password-protected operator login and access.
6. Open-database-connectivity compliant.

C. Network connecting the central station and workstations shall be a using TCP/IP with a capacity of connecting up to workstations. System shall be portable across multiple communication platforms without changing system software.

D. Network(s) connecting workstations and controllers shall consist of one or more of the following:

1. Local area, IEEE 802.3 Fast Ethernet , star topology network based on TCP/IP.
2. Local area, IEEE 802.11 compatible wireless mesh network, based on TCP/IP.
3. Direct-connected, RS-232 cable from the COM port of the central station to the first controller, then RS-485 cable to interconnect the remaining controllers at that Location.

2.4 OPERATION

A. Security access system shall use a single database for access-control and credential-creation functions.

B. Distributed Processing: A fully distributed processing system.

1. Access-control information, including time, date, valid codes, access levels, and similar data, shall be downloaded to controllers so each controller can make access-control decisions.
2. Intermediate controllers for access control are prohibited.
3. In the event that communications with the central controller are lost, controllers shall automatically buffer event transactions until communications are restored, at which time buffered events shall be uploaded to the central station.

C. Number of Locations:

1. Support at least separate Locations using a single workstation with combinations of direct-connect, or TCP/IP LAN connections to each Location.

2. Each Location shall have its own database and history in the central station.
3. Locations may be combined to share a common database.

D. Data Capacity:

1. different card-reader formats.
2. comments.
3. graphic file types for importing maps.

E. Location Capacity:

1. reader-controlled doors.
2. total-access credentials.
3. supervised alarm inputs.
4. programmable outputs.
5. custom action messages per Location to instruct operator on action required when alarm is received.

F. System Network Requirements:

1. System components shall be interconnected and shall provide automatic communication of status changes, commands, field-initiated interrupts, and other communications required for proper system operation.
2. Communication shall not require operator initiation or response and shall return to normal after partial- or total-network interruption such as power loss or transient upset.
3. System shall automatically annunciate communication failures to the operator and shall identify the communications link that has experienced a partial or total failure.
4. Communications controller may be used as an interface between the central-station display systems and the field device network. Communications controller shall provide functions required to attain the specified network communications performance.

G. Central station shall provide operator interface, interaction, display, control, and dynamic and real-time monitoring. Central station shall control system networks to interconnect all system components, including workstations and field-installed controllers.

H. Field equipment shall include controllers, sensors, and controls.

1. Controllers shall serve as an interface between the central station and sensors and controls.
2. Data exchange between the central station and the controllers shall include down-line transmission of commands, software, and databases to controllers.
3. The up-line data exchange from the controller to the central station shall include status data such as intrusion alarms, status reports, and entry-control records.
4. Controllers are classified as alarm-annunciation or entry-control type.

I. System Response to Alarms:

1. Field device network shall provide a system end-to-end response time of second(s) or less for every device connected to the system.

2. Alarms shall be annunciated at the central station within one second of the alarm occurring at a controller or at a device controlled by a local controller, and within 100 ms if the alarm occurs at the central station.
3. Alarm and status changes shall be displayed within 100 ms after receipt of data by the central station.
4. All graphics shall be displayed, including graphics-generated map displays, on the console monitor within five seconds of alarm receipt at the security console.
5. This response time shall be maintained during system heavy load.

J. False-Alarm Reduction: The design of the central station and controllers shall contain features to reduce false alarms. Equipment and software shall comply with SIA CP-01.

K. Error Detection:

1. Use a cyclic code method to detect single- and double-bit errors, burst errors of eight bits or fewer, and at least 99 percent of all other multibit and burst errors between controllers and the central station.
2. Interactive or product error-detection codes alone will not be acceptable.
3. A message shall be in error if one bit is received incorrectly.
4. Retransmit messages with detected errors.
5. Allow for an operator-assigned two-digit decimal number to each communications link representing the number of retransmission attempts.
6. Central station shall print a communication failure alarm message when the number of consecutive retransmission attempts equals the assigned quantity.
7. Monitor the frequency of data transmission failure for display and logging.

L. Data Line Supervision: System shall initiate an alarm in response to opening, closing, shorting, or grounding of data transmission lines.

M. Door Hardware Interface:

1. Comply with requirements in Section 087100 "Door Hardware" and Section 087111 "Door Hardware (Descriptive Specification)" for door hardware required to be monitored or controlled by the security access system.
2. Electrical characteristics of controllers shall match the signal and power requirements of door hardware.

2.5 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70, "National Electrical Code."

C. Comply with **SIA** DC-03.

2.6 APPLICATION SOFTWARE

A. System Software: Based on bit, central-station and workstation operating system and application software.

1. Multiuser multitasking shall allow independent activities and monitoring to occur simultaneously at different workstations.
2. Graphical user interface shall show pull-down menus and a menu-tree format.
3. Capability for future additions within the indicated system size limits.
4. Open architecture that allows importing and exporting of data and interfacing with other systems that are compatible with operating system.
5. Password-protected operator login and access.

B. Peer Computer Control Software: Detect a failure of a central computer and cause the other central computer to assume control of all system functions without interruption of operation. Both central computers shall have drivers to support this mode of operation.

C. Application Software: Interface between the alarm annunciation and entry-control controllers to monitor sensors, operate displays, report alarms, generate reports, and help train system operators.

1. Reside at the central station, workstations, and controllers as required to perform specified functions.
2. Operate and manage peripheral devices.
3. Manage files for disk I/O, including creating, deleting, and copying files; and automatically maintain a directory of all files, including size and location of each sequential and random-ordered record.
4. Import custom icons into graphics to represent alarms and I/O devices.
5. Globally link I/O so that any I/O can link to any other I/O within the same Location without requiring interaction with the host workstation. This operation shall be at the controller.
6. Globally code I/O links so that any access-granted event can link to any I/O with the same Location without requiring interaction with the host workstation. This operation shall be at the controller.
7. Messages from workstation to controllers and controllers to controllers shall be on a polled network that utilizes check summing and acknowledgment of each message. Communication shall be automatically verified, buffered, and retransmitted if message is not acknowledged.
8. Selectable poll frequency and message time-out settings shall handle bandwidth and latency issues for TCP/IP, RF, and other workstation-to-controller communications methods by changing the polling frequency and the amount of time the system waits for a response.
9. Automatic and encrypted backups for database and history backups shall be automatically stored at and encrypted with a nine-character alphanumeric password that must be used to restore or read data contained in backup.
10. Operator audit trail for recording and reporting all changes made to database and system software.
11. Support network protocol and topology, TCP/IP, Novel Netware, Digital Pathworks, Banyan Vines, LAN/WAN, and RAS.

D. Workstation Software:

1. Password levels shall be individually customized at each workstation to allow or disallow operator access to program functions for each Location.
2. Workstation event filtering shall allow user to define events and alarms that will be displayed at each workstation. If an alarm is unacknowledged (not handled by another workstation) for a preset amount of time, the alarm will automatically appear on the filtered workstation.

E. Controller Software:

1. Controllers shall operate as autonomous, intelligent processing units.

    a. Controllers shall make decisions about access control, alarm monitoring, linking functions, and door-locking schedules for their operation, independent of other system components.
    b. Controllers shall be part of a fully distributed processing-control network.
    c. The portion of the database associated with a controller, and consisting of parameters, constraints, and the latest value or status of points connected to that controller, shall be maintained in the controller.

2. The following functions shall be fully implemented and operational within each controller:

    a. Monitoring inputs.
    b. Controlling outputs.
    c. Automatically reporting alarms to the central station.
    d. Reporting of sensor and output status to the central station on request.
    e. Maintaining real time, automatically updated by the central station at least once a day.
    f. Communicating with the central station.
    g. Executing controller resident programs.
    h. Diagnosing.
    i. Downloading and uploading data to and from the central station.

3. Controller Operations at a Location:

    a. Up to controllers connected to TIA 485-A communications loop. Globally operating I/O linking and anti-passback functions between controllers within the same Location without central-station or workstation intervention. Linking and anti-passback shall remain fully functional within the same Location even when the central station or workstations are off-line.
    b. In the event of communication failure between the central station and a Location, there shall be no degradation in operations at the controllers at that Location. Controllers at each Location shall be connected to a memory buffer with a capacity to store up to 10,000 events; there shall be no loss of transactions in system history files until the buffer overflows.
    c. Buffered events shall be handled in a first-in-first-out mode of operation.

4. Individual Controller Operation:

    a. Controllers shall transmit alarms, status changes, and other data to the central station when communications circuits are operable. If communications are not

available, controllers shall function in a stand-alone mode; operational data, including the status and alarm data normally transmitted to the central station, shall be stored for later transmission to the central station. Storage capacity for the latest 1024 events shall be provided at each controller.

b. Card-reader ports of a controller shall be custom configurable for at least different card-reader or keypad formats. Multiple reader or keypad formats may be used simultaneously at different controllers or within the same controller.
c. Controllers shall provide a response to card readers or keypad entries in less than 0.25 seconds, regardless of system size.
d. Controllers that are reset, or powered up from a nonpowered state, shall automatically request a parameter download and reboot to their proper working state. This shall happen without any operator intervention.
e. Initial Startup: When controllers are brought on-line, database parameters shall be automatically downloaded to them. After initial download is completed, only database changes shall be downloaded to each controller.
f. On failure for any reason, controllers shall perform an orderly shutdown and force controller outputs to a predetermined failure-mode state, consistent with the failure modes shown and the associated control device.
g. After power is restored, following a power failure, startup software shall initiate self-test diagnostic routines, after which controllers shall resume normal operation.
h. After controller failure, if the database and application software are no longer resident, controllers shall not restart but shall remain in the failure mode until repaired. If database and application programs are resident, controllers shall immediately resume operation. If not, software shall be restored automatically from the central station.

5. Communications Monitoring:

a. System shall monitor and report status of TIA 485-A communications loop of each Location.
b. Communication status window shall display which controllers are currently communicating, a total count of missed polls since midnight, and which controller last missed a poll.
c. Communication status window shall show the type of CPU, the type of I/O board, and the amount of RAM for each controller.

6. Operating systems shall include a real-time clock function that maintains seconds, minutes, hours, day, date, and month. The real-time clock shall be automatically synchronized with the central station at least once a day to plus or minus 10 seconds. The time synchronization shall be automatic, without operator action and without requiring system shutdown.

F. Workstation-to-Controller Communications:

1. Central-station or workstation communications shall use the following:

a. Direct connection using serial ports of the workstation.
b. TCP/IP LAN interface cards.
c. Dial-up or cable modems for connections to Locations.

2. Each serial port used for communications shall be individually configurable for "direct communications," "modem communications incoming and outgoing," or "modem communications incoming only," or as an ASCII output port. Serial ports shall have adjustable data transmission rates and shall be selectable under program control.
3. Use multiport communications board if more than two serial ports are needed.

    a. Use a 4-, 8-, or 16-serial port configuration that is expandable to 32- or 64-serial ports.
    b. Connect the first board to an internal PCI bus adapter card.

4. Direct serial, TCP/IP, and dial-up, cable, or satellite communications shall be alike in the monitoring or control of the system except for the connection that must first be made to a dial-up or voice-over IP Location.
5. TCP/IP network interface card (NIV) shall have an option to set the poll-frequency and message-response time-out settings.
6. Workstation-to-controller and controller-to-controller communications (direct, dial-up, or TCP/IP) shall use a polled-communication protocol that checks sum and acknowledges each message. All communications in this subparagraph shall be verified and buffered, and retransmitted if not acknowledged.

G. Direct Serial or TCP/IP Workstation-to-Controller Communications:

1. Communication software on the workstation shall supervise the workstation-to-controller communications link.
2. Loss of communications to any controller shall result in an alarm at all workstations running the communication software.
3. When communications are restored, all buffered events shall automatically upload to the workstation, and any database changes shall be automatically sent to the controller.

H. Broadband Workstation-to-Controller Communications:

1. Communication software on the workstation shall supervise the workstation-to-controller communications link during dial-up modem connect times.
2. Communication software shall be programmable to routinely poll each of the remote dial-up or cable modem Locations, collecting event logs and verifying phone lines at operator-selectable time intervals for each Location.
3. System shall be programmable for dialing and connecting to all dial-up or cable modem Locations and for retrieving the accrued history transactions on an automatic basis as often as once every minutes and up to once every minutes.
4. Failure to communicate to a dial-up Location three times in a row shall result in an alarm at the workstation.
5. Time offset capabilities shall be present so that Locations in a different geographical time zone than the host workstation will be set to, and maintained at, the proper local time. This feature shall allow for geographical time zones that are ahead of or behind the host workstation.
6. The controller connected to a dial-up or cable modem shall automatically buffer all normal transactions until its buffer reaches 80 percent of capacity. When the transaction buffer reaches 80 percent, the controller shall automatically initiate a call to the central station and upload all transactions.
7. Alarms shall be reported immediately.

8. Dial-up or cable modems shall be provided by manufacturer of the system. Modems used at the controller shall be powered by the controller. Power to the modem shall include battery backup if the controller is so equipped.

I. Controller-to-Controller Communications:

1. TIA 485-A, four-wire, point-to-point, regenerative (repeater) communications network methodology.
2. TIA 485-A communications signal shall be regenerated at each controller.

J. Database Downloads:

1. All data transmissions from workstations to a Location, and between controllers at a Location, shall include a complete database checksum to check the integrity of the transmission. If the data checksum does not match, a full data download shall be automatically retransmitted.
2. If a controller is reset for any reason, it shall automatically request and receive a database download from the workstation. The download shall restore data stored at the controller to their normal working state and shall take place with no operator intervention.

K. Operator Interface:

1. Inputs in system shall have two icon representations, one for the normal state and one for the abnormal state.
2. When viewing and controlling inputs, displayed icons shall automatically change to the proper icon to display the current system state in real time. Icons shall also display the input's state, whether armed or bypassed, and if the input is in the armed or bypassed state due to a time zone or a manual command.
3. Outputs in system shall have two icon representations, one for the secure (locked) state and one for the open (unlocked) state.
4. Icons displaying status of the I/O points shall be constantly updated to show their current real-time condition without prompting by the operator.
5. The operator shall be able to scroll the list of I/Os and press the appropriate toolbar button, or right click, to command the system to perform the desired function.
6. Graphic maps or drawings containing inputs, outputs, and override groups shall include the following:

    a. Database to import and store full-color maps or drawings and allow for input, output, and override group icons to be placed on maps.
    b. Maps to provide real-time display animation and allow for control of points assigned to them.
    c. System to allow inputs, outputs, and override groups to be placed on different maps.
    d. Software to allow changing the order or priority in which maps will be displayed.

7. Override Groups Containing I/Os:

    a. System shall incorporate override groups that provide the operator with the status and control over user-defined "sets" of I/Os with a single icon.
    b. Icon shall change automatically to show the live summary status of points in that group.

c. Override group icon shall provide a method to manually control or set to time-zone points in the group.
d. Override group icon shall allow the expanding of the group to show icons representing the live status for each point in the group, individual control over each point, and the ability to compress the individual icons back into one summary icon.

8. Schedule Overrides of I/Os and Override Groups:

a. To accommodate temporary schedule changes that do not fall within the holiday parameters, the operator shall have the ability to override schedules individually for each input, output, or override group.
b. Each schedule shall be composed of a minimum of two dates with separate times for each date.
c. The first time and date shall be assigned the override state that the point shall advance to when the time and date become current.
d. The second time and date shall be assigned the state that the point shall return to when the time and date become current.

9. Copy command in database shall allow for like data to be copied and then edited for specific requirements, to reduce redundant data entry.

L. Operator Access Control:

1. Control operator access to system controls through password-protected operator levels. System operators and managers with appropriate password clearances shall be able to change operator levels for operators.
2. Three successive attempts by an operator to execute functions beyond their defined level during a 24-hour period shall initiate a software tamper alarm.
3. A minimum of unique user accounts shall be available with the system software. System shall display the operator's name or initials in the console's first field. System shall print the operator's name or initials, action, date, and time on the system printer at login and logoff.
4. The password shall not be displayed or printed.
5. Each password shall be definable and assignable for the following:

a. Selected commands to be usable.
b. Access to system software.
c. Access to application software.
d. Individual zones that are to be accessed.
e. Access to database.

M. Operator Commands:

1. Command Input: Plain-language words and acronyms shall allow operators to use the system without extensive training or data-processing backgrounds. System prompts shall be a word, a phrase, or an acronym.
2. Command inputs shall be acknowledged and processing shall start in not less than second(s).
3. Tasks that are executed by operator's commands shall include the following:

a. Acknowledge Alarms: Used to acknowledge that the operator has observed the alarm message.
b. Place Zone in Access: Used to remotely disable intrusion-alarm circuits emanating from a specific zone. System shall be structured so that console operator cannot disable tamper circuits.
c. Place Zone in Secure: Used to remotely activate intrusion-alarm circuits emanating from a specific zone.
d. System Test: Allows the operator to initiate a system-wide operational test.
e. Zone Test: Allows the operator to initiate an operational test for a specific zone.
f. Print reports.
g. Change Operator: Used for changing operators.
h. Security Lighting Controls: Allows the operator to remotely turn on or turn off security lights.
i. Display Graphics: Used to show any graphic displays implemented in the system. Graphic displays shall be completed within 20 seconds from time of operator command.
j. Run system tests.
k. Generate and format reports.
l. Request help with the system operation.

1) Include in main menus.
2) Provide unique, descriptive, context-sensitive help for selections and functions with the press of one function key.
3) Provide navigation to specific topic from within the first help window.
4) Help shall be accessible outside the application program.

m. Entry-Control Commands:

1) Lock (secure) or unlock (open) each controlled entry and exit up to times a day through time-zone programming.
2) Arm or disarm each monitored input up to times a day through time-zone programming.
3) Enable or disable readers or keypads up to times a day through time-zone programming.
4) Enable or disable cards or codes up to times a day per entry point through access-level programming.

4. Command Input Errors: Show operator input assistance when a command cannot be executed because of operator input errors. Assistance screen shall use plain-language words and phrases to explain why the command cannot be executed. Error responses that require an operator to look up a code in a manual or other document are not acceptable. Conditions causing operator assistance messages include the following:

a. Command entered is incorrect or incomplete.
b. Operator is restricted from using that command.
c. Command addresses a point that is disabled or out of service.
d. Command addresses a point that does not exist.
e. Command is outside the system's capacity.

N. Alarms:

1. System Setup:

    a. Assign manual and automatic responses to incoming-point status change or alarms.
    b. Automatically respond to input with a link to other inputs, outputs, or operator-response plans; unique sound with use of WAV files; and maps or images that graphically represent the point location.
    c. Sixty-character message field for each alarm.
    d. Operator-response-action messages shall allow message length of at least 65,000 characters, with database storage capacity of up to 32,000 messages. Setup shall assign messages to .
    e. Secondary messages shall be assignable by the operator for printing to provide further information and shall be editable by the operator.
    f. Allow 25 secondary messages with a field of four lines of 60 characters each.
    g. Store the most recent 1000 alarms for recall by the operator using the report generator.

2. Software Tamper:

    a. Annunciate a tamper alarm when unauthorized changes to system database files are attempted. Three consecutive unsuccessful attempts to log onto system shall generate a software tamper alarm.
    b. Annunciate a software tamper alarm when an operator or other individual makes three consecutive unsuccessful attempts to invoke functions beyond the authorization level.
    c. Maintain a transcript file of the last 5000 commands entered at each central station to serve as an audit trail. System shall not allow write access to system transcript files by any person, regardless of their authorization level.
    d. Allow only acknowledgment of software tamper alarms.

3. Read access to system transcript files shall be reserved for operators with the highest password authorization level available in system.
4. Animated Response Graphics: Highlight alarms with flashing icons on graphic maps; display and constantly update the current status of alarm inputs and outputs in real time through animated icons.
5. Multimedia Alarm Annunciation: WAV files to be associated with alarm events for audio annunciation or instructions.
6. Alarm Handling: Each input may be configured so that an alarm cannot be cleared unless it has returned to normal, with options of requiring the operator to enter a comment about disposition of alarm. Allow operator to silence alarm sound when alarm is acknowledged.
7. Alarm Automation Interface: High-level interface to central-station alarm automation software systems. Allows input alarms to be passed to and handled by automation systems in the same manner as burglar alarms, using a TIA 232-F ASCII interface.
8. CCTV Alarm Interface: Allow commands to be sent to CCTV systems during alarms (or input change of state) through serial ports.
9. Camera Control: Provides operator ability to select and control cameras from graphic maps.

O. Alarm Monitoring: Monitor sensors, controllers, and DTS circuits and notify operators of an alarm condition. Display higher-priority alarms first and, within alarm priorities, display the oldest unacknowledged alarm first. Operator acknowledgment of one alarm shall not be considered acknowledgment of other alarms nor shall it inhibit reporting of subsequent alarms.

1. Displayed alarm data shall include type of alarm, location of alarm, and secondary alarm messages.
2. Printed alarm data shall include type of alarm, location of alarm, date and time (to nearest second) of occurrence, and operator responses.
3. Maps shall automatically display the alarm condition for each input assigned to that map if that option is selected for that input location.
4. Alarms initiate a status of "pending" and require the following two handling steps by operators:

    a. First Operator Step: "Acknowledged." This action shall silence sounds associated with the alarm. The alarm remains in the system "Acknowledged" but "Un-Resolved."
    b. Second Operator Step: Operators enter the resolution or operator comment, giving the disposition of the alarm event. The alarm shall then clear.

5. Each workstation shall display the total pending alarms and total unresolved alarms.
6. Each alarm point shall be programmable to disallow the resolution of alarms until the alarm point has returned to its normal state.
7. Alarms shall transmit to the central station in real time except for allowing connection time for dial-up locations.
8. Alarms shall be displayed and managed from a minimum of four different windows.

    a. Input Status Window: Overlay status icon with a large red blinking icon. Selecting the icon will acknowledge the alarm.
    b. History Log Transaction Window: Display name, time, and date in red text. Selecting red text will acknowledge the alarm.
    c. Alarm Log Transaction Window: Display name, time, and date in red. Selecting red text will acknowledge the alarm.
    d. Graphic Map Display: Display a steady colored icon representing each alarm input location. Change icon to flashing red when the alarm occurs. Change icon from flashing red to steady red when the alarm is acknowledged.

9. Once an alarm is acknowledged, the operator shall be prompted to enter comments about the nature of the alarm and actions taken. Operator's comments may be manually entered or selected from a programmed predefined list, or a combination of both.
10. For locations where there are regular alarm occurrences, provide programmed comments. Selecting that comment shall clear the alarm.
11. The time and name of the operator who acknowledged and resolved the alarm shall be recorded in the database.
12. Identical alarms from the same alarm point shall be acknowledged at the same time the operator acknowledges the first alarm. Identical alarms shall be resolved when the first alarm is resolved.
13. Alarm functions shall have priority over downloading, retrieving, and updating database from workstations and controllers.
14. When a reader-controlled output (relay) is opened, the corresponding alarm point shall be automatically bypassed.

P. Monitor Display: Display text and graphic maps that include zone status integrated into the display. Colors are used for the various components and current data. Colors shall be uniform throughout the system.

1. Color Code:

    a. FLASHING RED: Alerts operator that a zone has gone into an alarm or that primary power has failed.
    b. STEADY RED: Alerts operator that a zone is in alarm and alarm has been acknowledged.
    c. YELLOW: Advises operator that a zone is in access.
    d. GREEN: Indicates that a zone is secure and that power is on.

2. Graphics:

    a. Support 32,000 graphic display maps and allow import of maps from a minimum of 16 standard formats from another drawing or graphics program.
    b. Allow I/O to be placed on graphic maps by the drag-and-drop method.
    c. Operators shall be able to view the inputs, outputs, and the point's name by moving the mouse cursor over the point on the graphic map.
    d. Inputs or outputs may be placed on multiple graphic maps. The operator shall be able to toggle to view graphic maps associated with I/Os.
    e. Each graphic map shall have a display-order sequence number associated with it to provide a predetermined order when toggled to different views.
    f. Camera icons shall have the ability to be placed on graphic maps that, when selected by an operator, will open a video window, display the camera associated with that icon, and provide pan-tilt-zoom control.
    g. Input, output, or camera placed on a map shall allow the ability to arm or bypass an input, open or secure an output, or control the pan-tilt-zoom function of the selected camera.

Q. System test software enables operators to initiate a test of the entire system or of a particular portion of the system.

1. Test Report: The results of each test shall be stored for future display or printout. The report shall document the operational status of system components.

R. Report-Generator Software: Include commands to generate reports for displaying, printing, and storing on disk and tape. Reports shall be stored by type, date, and time. Report printing shall be the lowest-priority activity. Report-generation mode shall be operator selectable but set up initially as periodic, automatic, or on request. Include time and date printed and the name of operator generating the report. Report formats may be configured by operators.

1. Automatic Printing: Setup shall specify, modify, or inhibit the report to be generated; the time the initial report is to be generated; the time interval between reports; the end of the period; and the default printer.
2. Printing on Request: An operator may request a printout of any report.
3. Alarm Reports: Reporting shall be automatic as initially set up. Include alarms recorded by system over the selected time and information about the type of alarm , the type of sensor, the location, the time, and the action taken.
4. Access and Secure Reports: Document zones placed in access, the time placed in access, and the time placed in secure mode.
5. Custom Reports: Reports tailored to exact requirements of who, what, when, and where. As an option, custom report formats may be stored for future printing.
6. Automatic History Reports: Named, saved, and scheduled for automatic generation.

7. Cardholder Reports: Include data, or selected parts of the data, as well as the ability to be sorted by name, card number, imprinted number, or by any of the user-defined fields.
8. Cardholder by Reader Reports: Based on who has access to a specific reader or group of readers by selecting the readers from a list.
9. Cardholder by Access-Level Reports: Display everyone that has been assigned to the specified access level.
10. Who Is "In" (Muster) Report:

    a. Emergency Muster Report: One-click operation on toolbar launches report.
    b. Cardholder Report. Contain a count of persons who are "In" at a selected Location and a detailed listing of name, date, and time of last use, sorted by the last reader used or by the group assignment.

11. Panel Labels Reports: Printout of control-panel field documentation including the actual location of equipment, programming parameters, and wiring identification. Maintain system installation data within system database so that data are available on-site at all times.
12. Activity and Alarm On-Line Printing: Activity printers for use at workstations; prints all events, or alarms only.
13. History Reports: Custom reports that allow the operator to select any date, time, event type, device, output, input, operator, Location, name, or cardholder to be included or excluded from the report.

    a. Initially store history on the hard disk of the host workstation.
    b. Permit viewing of the history on workstations or print history to any system printer.
    c. The report shall be definable by a range of dates and times with the ability to have a daily start and stop time over a given date range.
    d. Each report shall depict the date, time, event type, event description, and device; or I/O name, cardholder group assignment, and cardholder name or code number.
    e. Each line of a printed report shall be numbered to ensure that the integrity of the report has not been compromised.
    f. Total number of lines of the report shall be given at the end of the report. If the report is run for a single event such as "Alarms," the total shall reflect how many alarms occurred during that period.

14. Reports shall have the following four options:

    a. View on screen.
    b. Print to system printer. Include automatic print spooling and "Print To" options if more than one printer is connected to the system.
    c. "Save to File" with full path statement.
    d. System shall have the ability to produce a report indicating status of system inputs and outputs or of inputs and outputs that are abnormal, out of time zone, manually overridden, not reporting, or in alarm.

15. Custom Code List Subroutine: Allow the access codes of system to be sorted and printed according to the following criteria:

    a. Active, inactive, or future activate or deactivate.
    b. Code number, name, or imprinted card number.

c. Group, Location access levels.
d. Start and stop code range.
e. Codes that have not been used since a selectable number of days.
f. In, out, or either status.
g. Codes with trace designation.

16. The reports of system database shall allow options so that every data field may be printed.
17. The reports of system database shall be constructed so that the actual position of the printed data shall closely match the position of the data on the data-entry windows.

S. Anti-Passback:

1. System shall have global and local anti-passback features, selectable by Location. System shall support hard and soft anti-passback.
2. Hard Anti-Passback: Once a credential holder is granted access through a reader with one type of designation (IN or OUT), the credential holder may not pass through that type of reader designation until the credential holder passes through a reader of opposite designation.
3. Soft Anti-Passback: Should a violation of the proper IN or OUT sequence occur, access shall be granted, but a unique alarm shall be transmitted to the control station, reporting the credential holder and the door involved in the violation. A separate report may be run on this event.
4. Timed Anti-Passback: A controller capability that prevents an access code from being used twice at the same device (door) within a user-defined amount of time.
5. Provide four separate zones per Location that can operate without requiring interaction with the host workstation (done at controller). Each reader shall be assignable to one or all four anti-passback zones. In addition, each anti-passback reader can be further designated as "Hard," "Soft," or "Timed" in each of the four anti-passback zones. The four anti-passback zones shall operate independently.
6. The anti-passback schemes shall be definable for each individual door.
7. The Master Access Level shall override anti-passback.
8. System shall have the ability to forgive (or reset) an individual credential holder or the entire credential-holder population anti-passback status to a neutral status.

T. Visitor Assignment:

1. Provide for and allow an operator to be restricted to only working with visitors. The visitor badging subsystem shall assign credentials and enroll visitors. Allow only those access levels that have been designated as approved for visitors.
2. Provide an automated log of visitor name, time and doors accessed, and name of person contacted.
3. Allow a visitor designation to be assigned to a credential holder.
4. Security access system shall be able to restrict the access levels that may be assigned to credentials issued to visitors.
5. Allow operator to recall visitors' credential-holder file once a visitor is enrolled in the system.
6. The operator may designate any reader as one that deactivates the credential after use at that reader. The history log shall show the return of the credential.
7. System shall have the ability to use the visitor designation in searches and reports. Reports shall be able to print all or any visitor activity.

U. Time and Attendance:

1. Time and attendance reporting shall be provided to match IN and OUT reads and display cumulative time in for each day and cumulative time in for length designated in the report.
2. Shall be provided to match IN and OUT reads and display cumulative time in for each day and cumulative time in for length designated in the report.
3. System software setup shall allow designation of selected access-control readers as time and attendance hardware to gather the clock-in and clock-out times of the users at these readers.

    a. Reports shall show in and out times for each day, total time in for each day, and a total time in for period specified by the user.
    b. Allow the operator to view and print the reports, or save the reports to a file.
    c. Alphabetically sort reports on the person's last name, by Location or location group. Include all credential holders or optionally select individual credential holders for the report.

V. Training Software: Enables operators to practice system operation, including alarm acknowledgment, alarm assessment, response force deployment, and response force communications. System shall continue normal operation during training exercises and shall terminate exercises when an alarm signal is received at the console.

W. Entry-Control Enrollment Software: Database management functions that allow operators to add, delete, and modify access data as needed.

1. The enrollment station shall not have alarm response or acknowledgment functions.
2. Provide multiple, password-protected access levels. Database management and modification functions shall require a higher operator access level than personnel enrollment functions.
3. The program shall provide means to disable the enrollment station when it is unattended, to prevent unauthorized use.
4. The program shall provide a method to enter personnel identifying information into the entry-control database files through enrollment stations. In the case of personnel identity-verification subsystems, this shall include biometric data. Allow entry of personnel identifying information into the system database using menu selections and data fields. The data field names shall be customized during setup to suit user and site needs. Personnel identity-verification subsystems selected for use with the system shall fully support the enrollment function and shall be compatible with the entry-control database files.
5. Cardholder Data: Provide 99 user-defined fields. System shall have the ability to run searches and reports using any combination of these fields. Each user-defined field shall be configurable, using any combination of the following features:

    a. MASK: Determines a specific format with which data must comply.
    b. REQUIRED: Operator is required to enter data into field before saving.
    c. UNIQUE: Data entered must be unique.
    d. DEACTIVATE DATE: Data entered will be evaluated as an additional deactivate date for all cards assigned to this cardholder.
    e. NAME ID: Data entered will be considered a unique ID for the cardholder.

6. Personnel Search Engine: A report generator with capabilities such as search by last name, first name, group, or any predetermined user-defined data field; by codes not used in definable number of days; by skills; or by seven other methods.
7. Multiple Deactivate Dates for Cards: User-defined fields to be configured as additional stop dates to deactivate any cards assigned to the cardholder.
8. Batch card printing.
9. Default card data can be programmed to speed data entry for sites where most card data are similar.
10. Enhanced ASCII File Import Utility: Allows the importing of cardholder data and images.
11. Card Expire Function: Allows readers to be configured to deactivate cards when a card is used at selected devices.

2.7 SYSTEM DATABASE

A. Database and database management software shall define and modify each point in database using operator commands. Definition shall include parameters and constraints associated with each system device.

B. Database Operations:

1. System data management shall be in a hierarchical menu-tree format, with navigation through expandable menu branches and manipulated with use of menus and icons in a main menu and system toolbar.
2. Navigational Aids:

    a. Toolbar icons for add, delete, copy, print, capture image, activate, deactivate, and muster report.
    b. Point and click feature to facilitate data manipulation.
    c. Next and previous command buttons visible when editing database fields to facilitate navigation from one record to the next.
    d. Copy command and copy tool in the toolbar to copy data from one record to create a new similar record.

3. Data entry shall be automatically checked for duplicate and illegal data and shall be verified for valid format.
4. System shall generate a memo or note field for each item that is stored in database, allowing the storing of information about any defining characteristics of the item. Memo field is used for noting the purpose for which the item was entered, reasons for changes that were made, and the like.

C. File Management:

1. File management shall include database backup and restoration system, allowing selection of storage media, including 3.5-inch floppy disk, Zip and Jaz drives, and designated network resources.
2. Operations shall be both manual and automatic modes. The number of automatic sequential backups before the oldest backup will be overwritten; FIFO mode shall be operator selectable.

3. Backup program shall provide manual operation from any workstation on the LAN and shall operate while system remains operational.

D. Operator Passwords:

1. Support up to individual system operators, each with a unique password.
2. Allow passwords to be case sensitive.
3. Passwords shall not be displayed when entered.
4. Passwords shall have unique and customizable password profile and allow several operators to share a password profile. Include the following features in the password profile:

    a. Predetermine the highest-level password profile for access to all functions and areas of program.
    b. Allow or disallow operator access to any program operation, including the functions of View, Add, Edit, and Delete.
    c. Restrict doors to which an operator can assign access.

5. Operators shall use a user name and password to log on to system. This user name and password shall be used to access database areas and programs as determined by the associated profile.
6. Make provision to allow the operator to log off without fully exiting program. User may be logged off but program will remain running while displaying the login window for the next operator.

E. Access Card/Code Operation and Management: Access authorization shall be by card, by a manually entered code (PIN), or by a combination of both (card plus PIN).

1. Access authorization shall verify the facility code first, the card or card-and-PIN validation second, and the access level (time of day, day of week, date), anti-passback status, and number of uses last.
2. Use data-entry windows to view, edit, and issue access levels. Access-authorization entry-management system shall maintain and coordinate all access levels to prevent duplication or the incorrect creation of levels.
3. Allow assignment of multiple cards/codes to a cardholder.
4. Allow assignment of up to four access levels for each Location to a cardholder. Each access level may contain any combination of doors.
5. Each door may be assigned four time zones.
6. Access codes may be up to 11 digits in length.
7. Software shall allow the grouping of locations so cardholder data can be shared by all locations in the group.
8. Visitor Access: Issue a visitor badge for data tracking or photo ID purposes without assigning that person a card or code.
9. Cardholder Tracing: Allow for selection of cardholder for tracing. Make a special audible and visible annunciation at control station when a selected card or code is used at a designated code reader. Annunciation shall include an automatic display of the cardholder image.
10. Allow each cardholder to be given either an unlimited number of uses or a number from one to 9999 that regulates the number of times the card can be used before it is automatically deactivated.

11. Provide for cards and codes to be activated and deactivated manually or automatically by date. Provide for multiple deactivate dates to be preprogrammed.

F. Security Access Integration:

1. Photo ID badging and photo verification shall use the same database as the security access and may query data from cardholder, group, and other personal information to build a custom ID badge.
2. Automatic or manual image recall and manual access based on photo verification shall also be a means of access verification and entry.
3. System shall allow sorting of cardholders together by group or other characteristic for a fast and efficient method of reporting on, and enabling or disabling, cards or codes.

G. Key control and tracking shall be an integrated function of cardholder data.

1. Provide the ability to store information about which conventional metal keys are issued and to whom, along with key construction information.
2. Reports shall be designed to list everyone who possesses a specified key.

H. Facility Codes: System shall accommodate up to 2048 facility codes per Location, with the option of allowing facility codes to work at all doors or only at particular doors.

I. Operator Comments:

1. With the press of one appropriate button on the toolbar, the user shall be permitted to enter operator comments into the history at any time.
2. Automatic prompting of operator comment shall occur before the resolution of each alarm.
3. Operator comments shall be recorded by time, date, and operator number.
4. Comments shall be sorted and viewed through reports and history.
5. The operator may enter comments in two ways; either or both may be used:

    a. Manually entered through keyboard data entry (typed), up to 65,000 characters per each alarm.
    b. Predefined and stored in database for retrieval on request.

6. System shall have a minimum of 999 predefined operator comments with up to 30 characters per comment.

J. Group:

1. Group names may be used to sort cardholders into groups that allow the operator to determine the tenant, vendor, contractor, department, division, or any other designation of a group to which the person belongs.
2. System software shall have the capacity to assign one of 32,000 group names to an access authorization.
3. Make provision in software to deactivate and reactivate all access authorizations assigned to a particular group.
4. Allow sorting of history reports and code list printouts by group name.

K. Time Zones:

1. Each zone consists of a start and stop time for seven days of the week and three holiday schedules. A time zone is assigned to inputs, outputs, or access levels to determine when an input shall automatically arm or disarm, when an output automatically opens or secures, or when access authorization assigned to an access level will be denied or granted.
2. Up to four time zones may be assigned to inputs and outputs to allow up to four arm or disarm periods per day or four lock or unlock periods per day; up to three holiday override schedules may be assigned to a time zone.
3. Data-entry window shall display a dynamically linked bar graph showing active and inactive times for each day and holiday, as start and stop times are entered or edited.

L. Holidays:

1. Three different holiday schedules may be assigned to a time zone. Holiday schedule consists of date in format MM/DD/YYYY and a description. When the holiday date matches the current date of the time zone, the holiday schedule replaces the time-zone schedule for that 24-hour period.
2. System shall have the capacity for holidays.
3. Three separate holiday schedules may be applied to a time zone.
4. Holidays have an option to be designated as occurring on the designated date each year. These holidays remain in the system and will not be purged.
5. Holidays not designated to occur each year shall be automatically purged from the database after the date expires.

M. Access Levels:

1. System shall allow for the creation of up to access levels.
2. One level shall be predefined as the Master Access Level. The Master Access Level shall work at all doors at all times and override any anti-passback.
3. System shall allow for access to be restricted to any area by reader and by time. Access levels shall determine when and where an Identifier is authorized.
4. System shall be able to create multiple door and time-zone combinations under the same access level so that an Identifier may be valid during different time periods at different readers even if the readers are on the same controller.

N. User-Defined Fields:

1. System shall provide a minimum of 99 user-defined fields, each with up to 50 characters, for specific information about each credential holder.
2. System shall accommodate a title for each field; field length shall be 20 characters.
3. A "Required" option may be applied to each user-defined field that, when selected, forces the operator to enter data in the user-defined field before the credential can be saved.
4. A "Unique" option may be applied to each user-defined field that, when selected, will not allow duplicate data from different credential holders to be entered.
5. Data format option may be assigned to each user-defined field that will require the data to be entered with certain character types in specific spots in the field entry window.
6. A user-defined field, if selected, will define the field as a deactivate date. The selection shall automatically cause the data to be formatted with the windows MM/DD/YYYY date format. The credential of the holder will be deactivated on that date.

7. A search function shall allow any one user-defined field or combination of user-defined fields to be searched to find the appropriate cardholder. The search function shall include a search for a character string.
8. System shall have the ability to print cardholders based on and organized by the user-defined fields.

O. Code Tracing:

1. System shall perform code tracing selectable by cardholder and by reader.
2. Any code may be designated as a "traced code" with no limit to how many codes can be traced.
3. Any reader may be designated as a "trace reader" with no limit to which or how many readers can be used for code tracing.
4. When a traced code is used at a trace reader, the access-granted message that usually appears on the monitor window of the central station shall be highlighted with a different color than regular messages. A short singular beep shall occur at the same time the highlighted message is displayed on the window.
5. The traced cardholder image (if image exists) shall appear on workstations when used at a trace reader.

2.8 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors.
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarms and indicate locations.

2.9 CENTRAL-STATION HARDWARE

A. Central-Station Computer: Standard workstation of modular design.

B. Redundant Central Computer: One identical redundant central computer, connected in a hot standby, peer configuration. This computer shall automatically maintain its own copies of system software, application software, and data files. System transactions and other activities that alter system data files shall be updated to system files of redundant computer in near real time. If central computer fails, redundant computer shall assume control immediately and automatically.

C. Desktop Workstations:

D. Refer to Contract drawing CS603 for full Access Control System part numbers procured by Owner.

2.10 FIXED MAP DISPLAY

A. A fixed map display shall show layout of the protected facilities. Zones corresponding to those monitored by the system shall be highlighted on the display. Status of each zone shall be displayed using digital displays as required within each designated zone. A digital display test switch shall be provided on the map display.

2.11 CONTROLLERS

A. Controllers: Intelligent peripheral control unit, complying with UL 294, that stores time, date, valid codes, access levels, and similar data downloaded from the central station or workstation for controlling its operation.

B. Subject to compliance with requirements in this article, manufacturers may use multipurpose controllers.

C. Battery Backup: Sealed, lead acid; sized to provide run time during a power outage of 90 minutes, complying with UL 924.

D. Alarm Annunciation Controller:

1. The controller shall automatically restore communication within 10 seconds after an interruption with the field device network.

    a. Inputs: Monitor dry contacts for changes of state that reflect alarm conditions. Provides at least eight alarm inputs, which are suitable for wiring as normally open or normally closed contacts for alarm conditions.
    b. Alarm-Line Supervision:

        1) Supervise the alarm lines by monitoring each circuit for changes or disturbances in the signal using dc change measurements. System shall initiate an alarm in response to an abnormal current, which is a dc change of percent or more for longer than 500 ms.
        2) Transmit alarm-line-supervision alarm to the central station during the next interrogation cycle after the abnormal current condition.

    c. Outputs: Managed by central-station software.

2. Auxiliary Equipment Power: A GFI service outlet inside the controller enclosure.

E. Entry-Control Controller:

1. Function: Provide local entry-control functions including one- and two-way communications with access-control devices such as card readers, keypads, biometric personnel identity-verification devices, door strikes, magnetic latches, gate and door operators, and exit push buttons.

a. Operate as a stand-alone portal controller using the downloaded database during periods of communication loss between the controller and the field-device network.
b. Accept information generated by the entry-control devices; automatically process this information to determine valid identification of the individual present at the portal:

1) On authentication of the credentials or information presented, check privileges of the identified individual, allowing only those actions granted as privileges.
2) Privileges shall include, but are not limited to, time of day control, day of week control, group control, and visitor escort control.

c. Maintain a date-, time-, and Location-stamped record of each transaction. A transaction is defined as any successful or unsuccessful attempt to gain access through a controlled portal by the presentation of credentials or other identifying information.

2. Inputs:

a. Data from entry-control devices; use this input to change modes between access and secure.
b. Database downloads and updates from the central station that include enrollment and privilege information.

3. Outputs:

a. Indicate success or failure of attempts to use entry-control devices and make comparisons of presented information with stored identification information.
b. Grant or deny entry by sending control signals to portal-control devices.
c. Maintain a date-, time-, and Location-stamped record of each transaction and transmit transaction records to the central station.
d. Door Prop Alarm: If a portal is held open for longer than , alarm sounds.

4. With power supplies sufficient to power at voltage and frequency required for field devices and portal-control devices.
5. Data Line Problems: For periods of loss of communication with the central station, or when data transmission is degraded and generating continuous checksum errors, the controller shall continue to control entry by accepting identifying information, making authentication decisions, checking privileges, and controlling portal-control devices.

a. Store up to transactions during periods of communication loss between the controller and access-control devices for subsequent upload to the central station on restoration of communication.

6. Controller Power: NFPA 70, Class II power-supply transformer, with 12- or 24-V ac secondary, backup battery and charger.

a. Backup Battery: -regulated, recombinant-sealed, lead-calcium battery; spill proof; with a full one-year warranty and a pro rata -year warranty. With single-stage, constant-voltage-current, limited battery charger, comply with battery

manufacturer's written instructions for battery terminal voltage and charging current recommendations for maximum battery life.

b. Backup Battery: Valve-regulated, recombinant-sealed, lead-acid battery; spill proof. With single-stage, constant-voltage-current, limited battery charger, comply with battery manufacturer's written instructions for battery terminal voltage and charging current recommendations for maximum battery life.

c. Backup Power-Supply Capacity: minutes of battery supply. Submit battery and charger calculations.

d. Power Monitoring: Provide manual, dynamic battery-load test, initiated and monitored at the control center; with automatic disconnection of the controller when battery voltage drops below controller limits. Report by using local controller-mounted digital displays and by communicating status to central station. Indicate normal power on and battery charger on trickle charge. Indicate and report the following:

1) Trouble Alarm: Normal power-off load assumed by battery.
2) Trouble Alarm: Low battery.
3) Alarm: Power off.

2.12 SECONDARY ALARM ANNUNCIATOR

A. Secondary Alarm Annunciation Site: A workstation with limited I/O capacity, consisting of a secondary alarm annunciation workstation .

2.13 ENROLLMENT CENTER

A. Equipment for enrolling personnel into, and removing personnel from, system database, using a dedicated desktop workstation

1. Include equipment to enroll selected biometric credentials.

B. Enrollment equipment shall support encoding of credential cards including cryptographic and other internal security checks as required for system.

1. Allow only authorized entry-control enrollment personnel to access the enrollment equipment using passwords.
2. Include enrollment-subsystem configuration controls and electronic diagnostic aids for subsystem setup and troubleshooting with the central station.
3. Enrollment-station records printer shall meet requirements of the report printer.

C. Entry-Control Enrollment Software:

1. Shall include database management functions for the system, and shall allow an operator to change and modify the data entered in the system as needed.
2. Software shall not have alarm response or acknowledgment functions as a programmable function.
3. Multiple, password-protected access levels shall be provided at the enrollment station.
4. Database management and modification functions shall require a higher operator-access level than personnel enrollment functions.

5. Software shall provide a means for disabling the enrollment station when it is unattended, to prevent unauthorized use.
6. Software shall provide a method to enter personnel identifying information into the entry-control database files through enrollment stations to include a credential unit in use at the installation.
7. In the case of personnel identity-verification subsystems, this data shall include biometric data.
8. Software shall allow entry of this data into the system database files through the use of simple menu selections and data fields. The data field names shall be customized to suit user and site needs.
9. Personnel identity-verification subsystems selected for use with the system shall fully support the enrollment function and shall be compatible with the entry-control database files.

D. Accessories:

1. Steel desk-type console, swivel chair on casters, and equipment racks.
2. Console and Equipment Racks: Comply with EIA/ECA-310-E.
3. Equipment, with the exception of the printers, shall be rack mounted in the console and equipment racks.
4. Storage Cabinet: Locking cabinet approximately 72 inches high, 36 inches wide, and 24 inches deep, with three adjustable shelves and two storage racks.

E. System Capacity: Number of badges shall be limited only by hard disk space. Badge templates and images shall be in color, supporting the maximum color capability of workstation operating system.

F. Badge Configuration:

1. Software for badge template creation shall include a template consisting of background and predetermined locations of photographs, text objects and data fields for text, and bar-code and biometric information. Include automatic sizing of data fields placed on a badge to compensate for names, which may otherwise be too large to fit in the area designated.
2. Allow different badge templates to be used for each department, tenant, or visitor.
3. As a setup option, templates shall be automatically selected for the badge, based on the group to which the credential holder is assigned. Allow the operator to override the automatic template selection and use a template chosen by the operator for creating a badge.
4. Setup shall determine which graphics and credential-holder information will be displayed and where on the card it will be placed. All data in the security access system, such as name, code, group, access level, and any of the 99 user-defined fields, shall be selectable, with the ability to place them anywhere on the card.
5. System shall include an importing, filing, and recall system of stored images and shapes that can be placed on the badge.
6. Allow multiple images on the same badge, including, but not limited to, bar codes, digital photos, and signatures.
7. Support transparent backgrounds so that image is only surrounded by the intended background and not by its immediate background.

G. Photo Imaging: Integral to security access.

1. Import images from bitmap file formats, digital cameras, TWAIN cameras, or scanners. Allow image cropping and editing, WYSIWYG badge-building application, and badge print-preview and printing capabilities.
2. System shall support multiple images stored for each credential holder, including signatures, portrait views, and profile views.

H. Text Objects: Badge configuration shall provide for creation of custom text as an object, allowing font selection, typing, scaling, and formatting of the text object. Formatting options shall include changing font, font size, text flow, and text alignment; bending or curving the text object into a circle or semicircle; applying 3-D effects; and applying predefined effects such as tilt, extrusion, or beveling. Text shall be placed and optionally automatically centered within any region of the badge layout.

I. Badges and Credential Cards:

1. Badges are credential cards that do not contain data to be read by card readers.
2. Credential cards shall store uniquely coded data used by card readers as an Identifier.

    a. Magnetic-Stripe Cards: Comply with ISO/IEC 7810, ISO/IEC 7811-1, ISO/IEC 7811-2, ISO/IEC 7811-6, and ISO/IEC 7811-7. Use single-layer magnetic tape material that is coated with a plastic, slick protective coat and affixed to the back of the credential card near the top.
    b. Wiegand Wire-Effect Cards: Ferromagnetic wires laminated into the credential card using binary digits specified for Wiegand readers to generate a unique credential card identification code.
    c. Proximity : Use proximity detection without physical contact with the reader for proper operation.

3. Allow entry-control card to be modified by lamination or direct print process during the enrollment process for use as a picture and identification badge without reduction of readability. The design shall allow for the addition of at least one slot or hole to accommodate the attachment of a clip for affixing the credential card to the type of badge holder used at the site.

    a. Card Size and Dimensional Stability: Standard size,; dimensionally stable so that an undamaged card with deformations resulting from normal use shall be readable by the card reader.
    b. Card Material: Abrasion resistant, nonflammable, and nontoxic; and impervious to solar radiation and effects of ultraviolet light.
    c. Card Construction: Core and laminate or monolithic construction. Lettering, logos, and other markings shall be hot stamped into the credential material or direct printed.

        1) Incorporate as a security enhancement.
        2) Furnish equipment for on-site assembly and lamination of credential cards.

    d. Card Durability and Maintainability: Designed and constructed to yield a useful lifetime of at least five years or 5000 insertions or swipes, whichever results in a longer period of time. Allow credential cards to be cleaned by wiping with a sponge or cloth wetted with soap and water.

J. Card-Making Equipment: Consisting of a workstation, video camera, video-imaging equipment, and a printer.

1. Camera: NTSC color standard, RGB video output, 470 lines minimum horizontal resolution, and automatic white balance with full rated output under illumination of 0.5 fc.
2. Video Imaging: Live-image capture software and hardware and a digital signature capture pad.
3. Standard workstation, modified as follows:

    a. Redundant workstation is not required.
    b. Printer is not required.
    c. UPS is not required.
    d. Sound card is not required.

4. Printer: Dye-sublimation resin thermal transfer, dpi resolution, 16.7 million colors, accepting cards ranging in size from 2.1 by 3 inches to 2.6 by 3.7 inches and having card thickness ranging from 0.020 to 0.060 inch. Printer shall have options for encoding magnetic stripe using tracks 1, 2, and 3. Throughput shall be not less than seconds per card.

2.14 DOOR AND GATE HARDWARE INTERFACE

A. Exit Device with Alarm: Operation of the exit device shall generate an alarm. Exit device and alarm contacts are specified in Section 087100 "Door Hardware."

B. Exit Alarm: Operation of a monitored door shall generate an alarm. Exit devices and alarm contacts are specified in Section 087100 "Door Hardware."

C. Electric Door Strikes: Use end-of-line resistors to provide power-line supervision. Signal switches shall transmit data to controller to indicate when the bolt is not engaged and the strike mechanism is unlocked, and they shall report a forced entry. Power and signal shall be from the controller. Electric strikes are specified in Section 087100 "Door Hardware."

D. Electromagnetic Locks: End-of-line resistors shall provide power-line supervision. Lock status sensing signal shall positively indicate door is secure. Power and signal shall be from the controller. Electromagnetic locks are specified in Section 087100 "Door Hardware."

2.15 FIELD-PROCESSING HARDWARE

A. Alarm Annunciation Local Processor:

1. Respond to interrogations from the field device network, recognize and store alarm status inputs until they are transmitted to the central station, and change outputs based on commands received from the central station.
2. Local processor shall also automatically restore communication within 10 seconds after an interruption with the field device network and provide dc line supervision on each of its alarm inputs.

3. Local processor inputs shall monitor dry contacts for changes of state that reflect alarm conditions.
4. Local processor shall have at least eight alarm inputs which allow wiring contacts as normally open or normally closed for alarm conditions; and shall provide line supervision for each input by monitoring each input for abnormal open, grounded, or shorted conditions using dc current change measurements.
5. Local processor shall report line supervision alarms to the central station.
6. Alarms shall be reported for any condition that remains abnormal at an input for longer than 500 milliseconds.
7. Alarm condition shall be transmitted to the central computer during the next interrogation cycle.
8. Local processor outputs shall reflect the state of commands issued by the central station.
9. Outputs shall be a form C contact and shall include normally open and normally closed contacts.
10. Local processor shall have at least four command outputs.
11. Local processor shall be able to communicate with the central station via RS-485 or TCP/IP as a minimum.

B. Processor Power Supply:

1. Local processor and sensors shall be powered from an uninterruptible power source.
2. Uninterruptible power source shall provide eight hours of battery back-up power in the event of primary power failure and shall automatically fully recharge the batteries within 12 hours after primary power is restored.
3. If the facility is without an emergency generator, the uninterruptible power source shall provide 24 hours of battery backup power.
4. There shall be no equipment malfunctions or perturbations or loss of data during the switch from primary to battery power and vice versa.
5. Batteries shall be sealed, non-outgassing type.
6. Power supply shall be equipped with an indicator for ac input power and an indicator for dc output power.
7. Loss of primary power shall be reported to the central station as an alarm.

C. Auxiliary Equipment Power: A GFI service outlet shall be furnished inside the local processor's enclosure.

D. Entry-Control Local Processor:

1. Entry-control local processor shall respond to interrogations from the field device network, recognize and store alarm status inputs until they are transmitted to the central station, and change outputs based on commands received from the central station.
2. Local processor shall also automatically restore communication within 10 seconds after an interruption with the field device network and provide dc line supervision on each of its alarm inputs.
3. Entry-control local processor shall provide local entry-control functions including communicating with field devices such as card readers, keypads, biometric personnel identity-verification devices, door strikes, magnetic latches, gate and door operators, and exit push buttons.
4. Processor shall also accept data from entry-control field devices as well as database downloads and updates from the central station that include enrollment and privilege information.

5. Processor shall send indications of successful or failed attempts to use entry-control field devices and shall make comparisons of presented information with stored identification information.
6. Processor shall grant or deny entry by sending control signals to portal-control devices and mask intrusion-alarm annunciation from sensors stimulated by authorized entries.
7. Entry-control local processor shall use inputs from entry-control devices to change modes between access and secure.
8. Local processor shall maintain a date-time- and location-stamped record of each transaction and transmit transaction records to the central station.
9. Processor shall operate as a stand-alone portal controller using the downloaded database during periods of communication loss between the local processor and the central station.
10. Processor shall store a minimum of 4000 transactions during periods of communication loss between the local processor and the central station for subsequent upload to the central station upon restoration of communication.
11. Local processor inputs shall monitor dry contacts for changes of state that reflect alarm conditions.
12. Local processor shall have at least eight alarm inputs which allow wiring contacts as normally open or normally closed for alarm conditions; and shall also provide line supervision for each input by monitoring each input for abnormal open, grounded, or shorted conditions using dc current change measurements.
13. Local processor shall report line supervision alarms to the central station.
14. Alarms shall be reported for any condition that remains abnormal at an input for longer than 500 ms.
15. Alarm condition shall be transmitted to the central station during the next interrogation cycle.
16. Entry-control local processor shall include the necessary software drivers to communicate with entry-control field devices. Information generated by the entry-control field devices shall be accepted by the local processor and automatically processed to determine valid identification of the individual present at the portal.
17. Upon authentication of the credentials or information presented, the local processor shall automatically check privileges of the identified individual, allowing only those actions granted as privileges.
18. Privileges shall include, but are not limited to, time of day control, day of week control, group control, and visitor escort control. The local processor shall maintain a date-time- and location-stamped record of each transaction.
19. Transaction is defined as any successful or unsuccessful attempt to gain access through a controlled portal by the presentation of credentials or other identifying information.
20. Local processor outputs shall reflect the state of commands issued by the central station.
21. Outputs shall be a form C contact and shall include normally open and normally closed contacts.
22. Local processor shall have at least four addressable outputs.
23. The entry-control local processor shall also provide control outputs to portal-control devices.
24. Local processor shall be able to communicate with the central station via RS-485 or TCP/IP as a minimum.
25. The system manufacturer shall provide strategies for downloading database information for panel configurations and cardholder data to minimize the required download time when using IP connectivity.

2.16 TIA 232-F ASCII INTERFACE SPECIFICATIONS

A. ASCII interface shall allow TIA 232-F connections to be made between the control station operating as the host workstation and any equipment that will accept TIA 232-F ASCII command strings, such as CCTV switches, intercoms, and paging systems.

1. Alarm inputs in system shall allow for individual programming to output up to four unique ASCII character strings through two different COM ports on the host workstation.
2. Inputs shall have the ability to be defined to transmit a unique ASCII string for alarm and one for restore through one COM port, and a unique ASCII string for a nonalarm, abnormal condition and one for a normal condition through the same or different COM port.
3. Predefined ASCII character strings shall have the ability to be up to 420 characters long with full use of all the ASCII control characters, such as return or line feed. Character strings shall be defined in the system database and then assigned to the appropriate inputs.
4. COM ports of the host workstation used to interface with external equipment shall be defined in the setup portion of the software. COM port's baud rate, word length, stop bits, and parity shall be definable in the software to match that of the external equipment.

B. Pager-System Interface: Alarms shall be able to activate a pager system with customized message for each input alarm.

1. TIA 232-F output shall be capable of connection to a pager interface that can be used to call a paging system or service and send a signal to a portable pager. System shall allow an individual alphanumeric message per alarm input to be sent to the paging system. This interface shall support both numeric and alphanumeric pagers.

C. Alarm-System Interface:

1. TIA 232-F output shall be capable of transmitting alarms from other monitoring and alarm systems to central-station automation software.
2. Alternatively, alarms that are received by this access-control system are to be transferred to the alarm automation system as if they were sent through a digital alarm receiver.

    a. System shall be able to transmit an individual message from any alarm input to a burglar-alarm automation monitoring system.
    b. System shall be able to append to each message a predefined set of character strings as a prefix and a suffix.

2.17 FLOOR-SELECT ELEVATOR CONTROL

A. Elevator access control shall be integral to security access.

1. System shall be capable of providing full elevator security and control through dedicated controllers without relying on the control-station host workstation for elevator control decisions.
2. Access-control system shall enable and disable car calls on each floor and floor-select buttons in each elevator car, restricting passengers' access to the floors where they have been given access.

3. System setup shall, through programming, automatically and individually secure and unsecure each floor-select button of a car by time and day. Each floor-select button within a car shall be separately controlled so that some floors may be secure while others remain unsecure.
4. When a floor-select button is secure, it shall require the passenger to use his or her access code and gain access to that floor before the floor-select button will operate. The passenger's credential shall determine which car call and floor-select buttons are to be enabled, restricting access to floors unless authorized by the system's access code database. Floor-select button shall be enabled only in the car where the credential holder is the passenger.

B. Security access system shall record which call button is pressed, along with credential and time information.

1. System controller shall record elevator access data.
2. The controller shall reset all additional call buttons that may have been enabled by the user's credential.
3. The floor-select elevator control shall allow for manual override from a workstation workstation either by individual floor or by cab.

2.18 REAL-TIME GUARD TOUR

A. Guard tour module shall provide the ability to plan, track, and route tours. Module shall input an alarm during tour if guard fails to make a station. Tours can be programmed for sequential or random tour-station order.

1. Guard tour setup shall define specific routes or tours for the guard to take, with time restrictions in which to reach every predefined tour station.
2. Guard tour activity shall be automatically logged to the central-station workstation's hard drive.
3. If the guard is early or late to a tour station, a unique alarm per station shall appear at the central station to indicate the time and station.
4. Guard tour setup shall allow the tours to be executed sequentially or in a random order with an overall time limit set for the entire tour instead of individual times for each tour station.
5. Setup shall allow recording of predefined responses that will display for the operator at the control station should a "Failed to Check In" alarm occur.

B. Guard tour module shall allow proprietary direct-connected systems to use security access-control hardware to perform guard tour management in real time.

C. A tour station is a physical location where a guard shall go and perform an action indicating that he or she has arrived. This action, performed at the tour station, shall be one of 13 different events with any combination of station types within the same tour. An event at a tour station shall be one of the following types:

1. Access Granted.
2. Access Denied Code.
3. Access Denied Card plus PIN.
4. Access Denied Time Zone.

5. Access Denied Level.
6. Access Denied Facility.
7. Access Denied Code Timer.
8. Access Denied Anti-Passback.
9. Access Granted Passback Violation.
10. Alarm.
11. Restored.
12. Input Normal.
13. Input Abnormal.

D. Guard tour and other system features shall operate simultaneously with no interference.

E. Guard Tour Module Capacity: 999 possible guard tour definitions with each tour having up to 99 tour stations. System shall allow all 999 tours to be running at the same time.

2.19 VIDEO AND CAMERA CONTROL

A. Control station or designated workstation displays live video from a CCTV source.

1. Control Buttons: On the display window, with separate control buttons to represent Left, Right, Up, Down, Zoom In, Zoom Out, Scan, and a minimum of two custom-command auxiliary controls.
2. Provide at least seven icons to represent different types of cameras, with ability to import custom icons. Provide option for display of icons on graphic maps to represent their physical location.
3. Provide the alarm-handling window with a command button that will display the camera associated with the alarm point.

B. Display mouse-selectable icons representing each camera source, to select source to be displayed. For CCTV sources that are connected to a video switcher, control station shall automatically send control commands through a COM port to display the requested camera when the camera icon is selected.

C. Allow cameras with preset positioning to be defined by displaying a different icon for each of the presets. Provide control with Next and Previous buttons to allow operator to cycle quickly through the preset positions.

2.20 TRANSFORMERS

A. NFPA 70, Class II control transformers, NRTL listed. Transformers for security access-control system shall not be shared with any other system.

2.21 CABLE AND ASSET MANAGEMENT SOFTWARE

A. Computer-based cable and asset management system, with fully integrated database and graphic capabilities, complying with requirements in TIA 606-B.

1. Document physical characteristics by recording the network, asset, user, TIA details, device configurations, and exact connections between equipment and cabling.

    a. Manage the physical layer of security system.
    b. List device configurations.
    c. List and display circuit connections.
    d. Record firestopping data.
    e. Record grounding and bonding connections and test data.

2. Information shall be presented in database view, schematic plans, or technical drawings.

    a. Microsoft Visio Technical Drawing shall be used as drawing and schematic plans software. Drawing symbols, system layout, and design shall comply with SIA/IAPSC AG-01.

3. System shall interface with the following testing and recording devices:

    a. Direct-upload tests from circuit testing instrument into the workstation.
    b. Direct-download circuit labeling into labeling printer.

B. Software shall be designed of the same version as security access system's central station and workstations and shall be installed on the designated workstation, using a hard drive dedicated only to this management function.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to workstations, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA 606-B, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Product Schedules: Obtain detailed product schedules from manufacturer of access-control system or develop product schedules to suit Project. Fill in all data available from Project plans and specifications and publish as Product Schedules for review and approval.

1. Record setup data for control station and workstations.
2. For each Location, record setup of controller features and access requirements.
3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
4. Set up groups, facility codes, linking, and list inputs and outputs for each controller.
5. Assign action message names and compose messages.
6. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.
7. Prepare and install alarm graphic maps.
8. Develop user-defined fields.
9. Develop screen layout formats.
10. Propose setups for guard tours and key control.
11. Discuss badge layout options; design badges.
12. Complete system diagnostics and operation verification.
13. Prepare a specific plan for system testing, startup, and demonstration.
14. Develop acceptance test concept and, on approval, develop specifics of the test.
15. Develop cable and asset-management system details; input data from construction documents. Include system schematics and Visio Technical Drawings in electronic format AutoCAD.

D. In meetings with Architect and Owner, present Product Schedules and review, adjust, and prepare final setup documents. Use approved, final Product Schedules to set up system software.

3.3 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Section 270553 "Identification for Communications Systems" and with TIA 606-B.

B. Using software specified in "Cable and Asset Management Software" Article, develop cable administration drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with the same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

D. At completion, cable and asset management software shall reflect as-built conditions.

3.4 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved. Assign software license to Owner.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.
2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.6 PROTECTION

A. Maintain strict security during the installation of equipment and software. Rooms housing the control station, and workstations that have been powered up shall be locked and secured with an activated burglar alarm and access-control system reporting to a central station complying with UL 1610, "Central-Station Burglar-Alarm Units," during periods when a qualified operator in the employ of Contractor is not present.

3.7 DEMONSTRATION

A. Owner's maintenance personnel to adjust, operate, and maintain security access system. See Section 017900 "Demonstration and Training."

B. Develop separate training modules for the following:

1. Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.
2. Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.
3. Security personnel.
4. Hardware maintenance personnel.
5. Corporate management.

END OF SECTION 281300

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 281500 - ACCESS CONTROL HARDWAR

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access Control System equipment.

B. Related Requirements:

1. Section 281300 "Access Control System Software and Database Management" for control and monitoring applications, workstations, and interfaces.

2. Section 280553.00 "Identification for Electronic Safety and Security" for labelling security devices.

1.2 DEFINITIONS

A. Credential: Data assigned to an entity and used to identify that entity.

B. DTS: Digital Termination Service. A microwave-based, line-of-sight communication provided directly to the end user.

C. Identifier: A credential card; keypad personal identification number; or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

D. Location: A Location on the network having a PC-to-controller communications link, with additional controllers at the Location connected to the PC-to-controller link with a TIA 485-A communications loop. Where this term is presented with an initial capital letter, this definition applies.

E. PC: Personal computer. Applies to the central station, workstations, and file servers.

F. RAS: Remote access services.

G. RF: Radio frequency.

H. ROM: Read-only memory. ROM data are maintained through losses of power.

I. TCP/IP: Transport control protocol/Internet protocol.

J. TWAIN: Technology without an Interesting Name. A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.

K. WMP: Windows media player.

L. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.

M. WYSIWYG: What You See Is What You Get. Text and graphics appear on the screen the same as they will in print.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on Drawings. Test and evaluation data presented in Product Data shall comply with SIA BIO-01.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Diagrams for cable management system.
2. System labeling schedules, including electronic copy of labeling schedules that are part of the cable and asset identification system of the software specified in Parts 2 and 3.
3. Wiring Diagrams. For power, signal, and control wiring. Show typical wiring schematics including the following:

    a. Workstation outlets, jacks, and jack assemblies.
    b. Patch cords.
    c. Patch panels.

4. Cable Administration Drawings: As specified in "Identification" Article.
5. Battery and charger calculations for central station, workstations, and controllers.

C. Product Schedules.

D. Samples: For workstation outlets, jacks, jack assemblies, and faceplates. For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For security system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on media of the hard-copy submittal.

2. System installation and setup guides with data forms to plan and record options and setup decisions.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Credential card blanks, ready for printing. Include enough credential cards for all personnel to be enrolled at the site plus an extra percent for future use.
2. Fuses of all kinds, power and electronic, equal to percent of amount installed for each size used, but no fewer than three units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Cable installer must have on staff an RCDD certified by Building Industry Consulting Service International.

B. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source from single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 deg F, and not more than 80 percent relative humidity, noncondensing.

B. Open each container; verify contents against packing list; and file copy of packing list, complete with container identification, for inclusion in operation and maintenance data.

C. Mark packing list with the same designations assigned to materials and equipment for recording in the system labeling schedules that are generated by software specified in "Cable and Asset Management Software" Article.

D. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient conditions of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.

2. Indoor, Controlled Environment: NEMA 250, Type 1 enclosure. System components, except the central-station control unit, installed in indoor environments shall be rated for continuous operation in ambient conditions of dry bulb and 20 to 90 percent relative humidity, noncondensing.
3. Indoor, Uncontrolled Environment: NEMA 250, enclosures. System components installed in indoor environments shall be rated for continuous operation in ambient conditions of dry bulb and 20 to 90 percent relative humidity, noncondensing.
4. Outdoor Environment: NEMA 250, NEMA 250, enclosures. System components installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of < dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation where exposed to rain as specified in NEMA 250, winds up to 85 mph.
5. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
6. Corrosive Environment: For system components subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones, provide NEMA 250, enclosures.

1.10 CONTRACTOR REQUIREMENTS

1. This project is limited to a list of prequalified Contractors (aka Vendors). Therefore, the following Vendors have been pre-qualified to submit a proposal based on their signed agreement to comply with the Terms and Conditions document set forth in the Term Contract T-2424: SURVEILLANCE & ACCESS CONTROL SYSTEMS MAINTENANCE, REPAIR & INSTALLATION SVS., issued August 1, 2017.
   a. A+ Technology & Security Solutions, Inc.
   b. Commercial Technology Contractors, Inc.
   c. Signal Electric Corp.
   d. General Alarm, LLC -Triad Security Systems
   e. Main Access Security System
   f. TDK Systems Group, Inc.
   g. Dynamic Security

PART 2 - PRODUCTS (PROCURED BY OWNER, INSTALLED BY CONTRACTOR)

2.1 OPERATION

A. Security access system hardware shall use a single database for access-control and credential-creation functions.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70, "National Electrical Code."

C. Comply with **SIA** DC-03.

2.3 ACCESS CONTROL SYSTEM EQUIPMENT

A. Refer to Contract drawing CS603 for full Access Control System part numbers procured by Owner.

2.4 CABLES

A. General Cable Requirements: Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and as recommended by system manufacturer for integration requirement.

B. PVC-Jacketed, TIA 232-F.

1. No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. PVC jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with UL 1581.

C. Plenum-Rated TIA 232-F Cables:

1. No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PE insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. Fluorinated ethylene propylene jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

D. PVC-Jacketed, TIA 485-A Cables:

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. NFPA 70 Type: Type CM.
6. Flame Resistance: Comply with UL 1581.

E. Plenum-Rated TIA 485-A Cables:

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. NFPA 70 Type: Type CMP
6. Flame Resistance: NFPA 262, Flame Test.

F. Multiconductor, PVC, Reader and Wiegand Keypad Cables:

1. No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semirigid PVC insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.
4. For TIA 232-F applications.

G. Paired, PVC, Reader and Wiegand Keypad Cables:

1. Three pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, individual aluminum-foil/polyester-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CM.
3. Flame Resistance: UL 1581 vertical tray.

H. Paired, PVC, Reader and Wiegand Keypad Cables:

1. Three pairs, twisted, No. 20 AWG, stranded (7x28) tinned copper conductors, polyethylene (polyolefin) insulation, individual aluminum-foil/polyester-tape shielded pairs each with No. 22 AWG, stranded (19x34) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CM.
3. Flame Resistance: UL 1581 vertical tray.

I. Paired, Plenum-Type, Reader and Wiegand Keypad Cables:

1. Three pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum-foil/polypropylene-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

J. Multiconductor, Plenum-Type, Reader and Wiegand Keypad Cables:

1. Six conductors, No. 20 AWG, stranded (7x28) tinned copper conductors, fluorinated-ethylene-propylene insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage plus tinned copper braid shield with 85 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

K. LAN Cabling:

1. Comply with requirements in Section 271513 "Communications Copper Horizontal Cabling."

2.5 TRANSFORMERS

A. NFPA 70, Class II control transformers, NRTL listed. Transformers for security access-control system shall not be shared with any other system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA 606-B, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Product Schedules: Obtain detailed product schedules from manufacturer of access-control system or develop product schedules to suit Project. Fill in all data available from Project plans and specifications and publish as Product Schedules for review and approval.

D. In meetings with Architect and Owner, present Product Schedules and review, adjust, and prepare final setup documents. Use approved, final Product Schedules to set up system software.

3.3 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. Install cables and wiring according to requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

D. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in

environmental airspaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

E. Install LAN cables using techniques, practices, and methods that are consistent with Category 5e rating of components and optical fiber rating of components, and that ensure Category 6 and optical fiber performance of completed and linked signal paths, end to end.

F. Boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

G. Install end-of-line resistors at the field device location and not at the controller or panel location.

3.4 CABLE APPLICATION

A. Comply with TIA 569-D, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. TIA 232-F Cabling: Install at a maximum distance of 50 ft. between terminations.

D. TIA 485-A Cabling: Install at a maximum distance of 4000 ft. between terminations.

E. Card Readers and Keypads:

1. Install number of conductor pairs recommended by manufacturer for the functions specified.
2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from controller to the reader is 250 ft., and install No. 20 AWG wire if maximum distance is 500 ft..
3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the controller.
4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.

F. Install minimum No. 16 AWG cable from controller to electrically powered locks.

G. Install minimum No. 18 AWG ac power wire from transformer to controller.

3.5 GROUNDING

A. Comply with Section 270526 "Grounding and Bonding for Communications Systems."

B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.
3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.6 INSTALLATION

A. Install card readers, keypads, and push buttons

3.7 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Section 270553 "Identification for Communications Systems" and with TIA 606-B.

B. Using software specified in "Cable and Asset Management Software" Article, develop cable administration drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with the same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

D. At completion, cable and asset management software shall reflect as-built conditions.

3.8 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved. Assign software license to Owner.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use tester approved for type and kind of installed cable. Test for faulty connectors, splices, and terminations. Test according to TIA 568-C.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for balanced twisted-pair cables must comply with minimum criteria in TIA 568-C.1.
2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Devices and circuits will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.
2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.11 DEMONSTRATION

A. Owner's maintenance personnel to adjust, operate, and maintain security access system. See Section 017900 "Demonstration and Training."

B. Develop separate training modules for the following:

1. Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.
2. Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.
3. Security personnel.
4. Hardware maintenance personnel.

5. Corporate management.

END OF SECTION 281500

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 282000 - VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Video Surveillance System equipment.

B. Related Requirements:

   1. Section 281300 "Access Control System Software and Database Management" to integrate access control system interface and control.
   2. Section 283100 "Intrusion Detection" to integrate video surveillance used for intrusion detection.

1.2 DEFINITIONS

A. AGC: Automatic gain control.

B. BNC: Bayonet Neill-Concelman - type of connector.

C. B/W: Black and white.

D. CCD: Charge-coupled device.

E. FTP: File transfer protocol.

F. IP: Internet protocol.

G. LAN: Local area network.

H. MPEG: Moving picture experts group.

I. NTSC: National Television System Committee.

J. PC: Personal computer.

K. PTZ: Pan-tilt-zoom.

L. RAID: Redundant array of independent disks.

M. TCP: Transmission control protocol - connects hosts on the Internet.

N. UPS: Uninterruptible power supply.

O. WAN: Wide area network.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. UPS: Sizing calculations.
5. Wiring Diagrams: For power, signal, and control wiring.

C. Design Data: Include an equipment list consisting of every piece of equipment by model number, manufacturer, serial number, location, and date of original installation. Add pretesting record of each piece of equipment, listing name of person testing, date of test, set points of adjustments, name and description of the view of preset positions, description of alarms, and description of unit output responses to an alarm.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for cameras, camera-supporting equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

C. Product Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient temperatures of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
2. Interior, Controlled Environment: System components, except central-station control unit, installed in interior environments shall be rated for continuous operation in ambient temperatures of dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
3. Interior, Uncontrolled Environment: System components installed in non- interior environments shall be rated for continuous operation in ambient temperatures of dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, enclosures.
4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph. Use NEMA 250, enclosures.
5. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 1 year from date of Substantial Completion.

1.8 CONTRACTOR REQUIREMENTS

1. This project is limited to a list of prequalified Contractors (aka Vendors). Therefore, the following Vendors have been pre-qualified to submit a proposal based on their signed agreement to comply with the Terms and Conditions document set forth in the Term Contract T-2424: SURVEILLANCE & ACCESS CONTROL SYSTEMS MAINTENANCE, REPAIR & INSTALLATION SVS., issued August 1, 2017.
   a. A+ Technology & Security Solutions, Inc.
   b. Commercial Technology Contractors, Inc.
   c. Signal Electric Corp.
   d. General Alarm, LLC -Triad Security Systems
   e. Main Access Security System
   f. TDK Systems Group, Inc.
   g. Dynamic Security

PART 2 - PRODUCTS (PROCURED BY OWNER, INSTALLED BY CONTRACTOR)

2.1 SYSTEM REQUIREMENTS

A. System shall provide high-quality delivery and processing of IP-based video, audio, and control data using standard Ethernet-based networks.

B. System shall have seamless integration of all video surveillance and control functions.

C. Graphical user interface software shall manage all IP-based video matrix switching and camera control functions, two-way audio communication, alarm monitoring and control, and recording and archive/retrieval management. IP system shall also be capable of integrating into larger system environments.

D. System design shall include all necessary compression software for high-performance, dual-stream, MPEG-2/MPEG-4 video. Unit shall provide connections for all video cameras, camera PTZ control data, bidirectional audio, discreet sensor inputs, and control system outputs.

E. All camera signals shall be compressed, encoded, and delivered onto the network for processing and control by the IP video-management software.

F. Camera system units shall be ruggedly built and designed for extreme adverse environments, complying with NEMA Type environmental standards.

G. Encoder/decoder combinations shall place video, audio, and data network stream that can be managed from multiple workstations on the user's LAN or WAN.

H. All system interconnect cables, workstation PCs, PTZ joysticks, and network intermediate devices shall be provided for full performance of specified system.

I. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors.
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections.

J. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.2 VIDEO SURVEILLANCE SYSTEM EQUIPMENT

A. Refer to Contract drawing CS606 for full Video System part numbers procured by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.

B. Examine roughing-in for LAN, WAN, and IP network before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRING

A. Comply with requirements in Section 270528 "Pathways for Communications Systems."

B. Wiring Method: Install cables in raceways unless otherwise indicated.

1. Except raceways are not required in accessible indoor ceiling spaces and attics.
2. Except raceways are not required in hollow gypsum board partitions.
3. Conceal raceways and wiring except in unfinished spaces.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

E. For communication wiring, comply with the following:

1. Section 271313 "Communications Copper Backbone Cabling."
2. Section 271323 "Communications Optical Fiber Backbone Cabling."
3. Section 271513 "Communications Copper Horizontal Cabling."

F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras and infrared illuminators level and plumb.

B. Install cameras with 84-inch-minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

C. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms and adjust.

D. Install power supplies and other auxiliary components at control stations unless otherwise indicated.

E. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.

F. Avoid ground loops by making ground connections only at the control station.

1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.

G. Identify system components, wiring, cabling, and terminals according to Section 270553 "Identification for Communications Systems."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:

    a. Prepare equipment list described in "Informational Submittals" Article.
    b. Verify operation of auto-iris lenses.
    c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
    d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
    e. Set and name all preset positions; consult Owner's personnel.
    f. Set sensitivity of motion detection.
    g. Connect and verify responses to alarms.
    h. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

E. Video surveillance system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
5. Provide a written report of adjustments and recommendations.

3.6 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens.

3.7 DEMONSTRATION

A. Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION 282000

Department of Community Affairs
Construction Project Review
Project No: 9184-23
PARTIAL RELEASE
ELECTRICAL
David Godbolt
Released: 10/17/23
N.J.S.A. 52:27D-119 ET SEQ., AS AMENDED

SECTION 283100 - INTRUSION DETECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Intrusion Detection System equipment.

B. Related Requirements:

1. Section 087100 - Door Hardware: Modifications to existing and proposed door hardware as required by Work of this Section.
2. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Electrical characteristics for Work of this Section.
3. Section 260526 - Grounding and Bonding for Electrical Systems: Grounding and bonding of intrusion detection equipment and circuits.
4. Section 280553 - Identification for Electronic Safety and Security: Engraved plastic nameplates as required for Work of this Section.
5. Section: Modifications to existing and proposed window hardware as required for Work of this Section.

1.2 REFERENCE STANDARDS

A. NFPA:

1. NFPA 70 - National Electrical Code.
2. NFPA 72 - National Fire Alarm and Signaling Code.
3. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

1.3 COORDINATION

A. Coordinate Work of this Section with Work of other Sections.

1.4 PREINSTALLATION MEETINGS

A. Convene minimum prior to commencing Work of this Section.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's catalog data showing electrical characteristics and connection requirements.

B. Shop Drawings: Indicate system wiring diagram showing each device and wiring connection; indicate annunciator layout and sequence of operation.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Qualifications Statements:

1. Submit qualifications for manufacturer and installer.
2. Submit manufacturer's approval of installer.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of intrusion detection equipment.

1.7 QUALITY ASSURANCE

A. Wiring Materials Located in Plenums:

1. Peak Optical Density: Not greater than 1/2.
2. Average Optical Density: Not greater than 3/20.
3. Flame Spread: Not greater than 5 feet when tested according to NFPA 262.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from areas involved in construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace Intrusion Detection System components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 1 year from date of Substantial Completion.

1.10 CONTRACTOR REQUIREMENTS

1. Contractors listed below are T-2424 ISU prequalified and are permitted to submit a bid.
   a. A+ Technology & Security Solutions, Inc.
   b. Commercial Technology Contractors, Inc.
   c. Signal Electric Corp.
   d. General Alarm, LLC -Triad Security Systems
   e. Main Access Security System
   f. TDK Systems Group, Inc.
   g. Dynamic Security

PART 2 - PRODUCTS (PROCURED BY OWNER, INSTALLED BY CONTRACTOR)

2.1 DESCRIPTION

A. Intrusion Detection System: Description: , modular, microprocessor-based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions.

B. Supervision: System components shall be continuously monitored for normal, alarm, supervisory, and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.
   1. Alarm Signal: Display at master control unit and actuate audible and visual alarm devices.
   2. Trouble Condition Signal: Distinct from other signals, indicating that system is not fully functional. Trouble signal shall indicate system problems such as battery failure, open or shorted transmission line conductors, or control-unit failure.
   3. Supervisory Condition Signal: Distinct from other signals, indicating an abnormal condition as specified for the particular device or control unit.

C. System Control: Master control unit shall directly monitor intrusion detection devices, control units associated with perimeter detection units, and connecting wiring in a multiplexed distributed control system or as part of a network.

D. System shall automatically reboot program without error or loss of status or alarm data after any system disturbance.

E. Operator Commands:
   1. Help with System Operation: Display all commands available to operator. Help command, followed by a specific command, shall produce a short explanation of the purpose, use, and system reaction to that command.
   2. Acknowledge Alarm: To indicate that alarm message has been observed by operator.
   3. Place Protected Zone in Access: Disable all intrusion-alarm circuits of a specific protected zone. Tamper circuits may not be disabled by operator.
   4. Place Protected Zone in Secure: Activate all intrusion-alarm circuits of a protected zone.
   5. Protected Zone Test: Initiate operational test of a specific protected zone.
   6. System Test: Initiate system-wide operational test.
   7. Print reports.

F. Timed Control at Master Control Unit: Allow automatically timed "secure" and "access" functions of selected protected zones.

G. Automatic Control of Related Systems: Alarm or supervisory signals from certain intrusion detection devices control the following functions in related systems:
1. Switch selected lights.
2. Shift elevator control to a different mode.
3. Open a signal path between certain intercommunication stations.
4. Shift sound system to "listening mode" and open a signal path to certain system speakers.
5. Switch signal to selected monitor from CCTV camera in vicinity of sensor signaling an alarm.

H. Printed Records of Events:
1. Print a record of alarm, supervisory, and trouble events on system printer. Sort and report by protected zone, device, and function. When master control unit receives a signal, print a report of alarm, supervisory, or trouble condition. Report type of signal (alarm, supervisory, or trouble), protected zone description, date, and time of occurrence. Differentiate alarm signals from other indications. When system is reset, report reset event with the same information concerning device, location, date, and time. Commands shall initiate the reporting of a list of current alarm, supervisory, and trouble conditions in system or a log of past events.

I. Response Time:
1. Two seconds between actuation of any alarm and its indication at master control unit.

J. Circuit Supervision:
1. Supervise all signal and data transmission lines, links with other systems, and sensors from master control unit. Indicate circuit and detection device faults with both protected zone and trouble signals, sound a distinctive audible tone, and illuminate an LED. Maximum permissible elapsed time between occurrence of a trouble condition and indication at master control unit is 20 seconds. Initiate an alarm in response to opening, closing, shorting, or grounding of a signal or data transmission line.

K. Programmed Secure-Access Control:
1. System shall be programmable to automatically change status of various combinations of protected zones between secure and access conditions at scheduled times. Status changes may be preset for repetitive, daily, and weekly; specially scheduled operations may be preset up to a year in advance. Manual secure-access control stations shall override programmed settings.

L. Manual Secure-Access Control:
1. Coded entries at manual stations shall change status of associated protected zone between secure and access conditions.

2.2 INTRUSION DETECTION SYSTEM EQUIPMENT

A. Refer to Contract drawing CS608 for full Intrusion Detection System part numbers procured by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that Site conditions comply with Contract Documents.

B. Verify that surfaces to receive detection devices are ready for installation.

3.2 SYSTEM INTEGRATION

A. Integrate intrusion detection system with the following systems and equipment:
   1. Electronic door hardware.
   2. Elevators.
   3. Network lighting controls.
   4. Intercommunications and program systems.
   5. Public address and mass notification systems.
   6. Access control.
   7. Fire-alarm system.
   8. Video surveillance.

3.3 SYSTEM INSTALLATION

A. Comply with UL 681 and NFPA 731.

B. Equipment Mounting: Install master control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.

C. Install wall-mounted equipment, with tops of cabinets not more than 72 inches above the finished floor.

D. Connecting to Existing Equipment: Verify that existing perimeter security system is operational before making changes or connections.
   1. Connect new equipment to existing control panel in existing part of the building.
   2. Connect new equipment to existing monitoring equipment at the Supervising Station.
   3. Expand, modify, and supplement existing equipment as necessary to extend existing functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.

E. Security Fasteners: Where accessible to inmates, install intrusion detection components using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials except that a maximum of two different sets of tools shall be required to operate security fasteners for Project.

3.4 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Existing Work:

1. Remove exposed, abandoned intrusion detection wiring.
2. Cut cable flush with walls and floors, and patch surfaces.
3. Disconnect and remove abandoned intrusion detection equipment.
4. Access:

    a. Maintain access to existing intrusion detection equipment, and other installations remaining active and requiring access.
    b. Modify installation or provide access panel.

5. Extend existing intrusion detection installations using materials and methods as specified.
6. Clean and repair existing intrusion detection equipment that is to remain or to be reinstalled.

3.5 WIRING INSTALLATION

A. Wiring Method: Minimum conduit size shall be 1/2 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

B. Wiring Method: Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

C. Wiring Method: Cable, concealed in accessible ceilings, walls, and floors when possible.

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Wires and Cables:
1. Conductors: Size as recommended in writing by system manufacturer unless otherwise indicated.
2. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
3. Control and Signal Transmission Conductors: Install unshielded, twisted-pair cable unless otherwise indicated or if manufacturer recommends shielded cable, according to

F. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

G. Install power supplies and other auxiliary components for detection devices at control units unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.

H. Identify components with engraved, laminated-plastic or metal nameplate for master control unit and each terminal cabinet, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 270553 "Identification for Communications Systems."

I. Install engraved plastic nameplates as specified in Section 280553 - Identification for Electronic Safety and Security.

J. Ground and bond intrusion detection equipment and circuits as specified in Section 260526 - Grounding and Bonding for Electrical Systems.

3.6 GROUNDING

A. Ground the master control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to master control unit.

B. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

C. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5-ohm ground. Measure, record, and report ground resistance.

D. Install grounding electrodes of type, size, location, and quantity indicated. Comply with installation requirements in Section 270500 "Common Work Results for Communications."

3.7 FIELD QUALITY CONTROL

A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for Systematic recording of acceptance test results.
   1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

E. Tests and Inspections: Comply with provisions in NFPA 731, Ch. 9, "Testing and Inspections."
   1. Inspection: Verify that units and controls are properly labeled, and interconnecting wires and terminals are identified.

2. Test Methods: Intrusion detection systems and other systems and equipment that are associated with detection and accessory equipment shall be tested according to Table "Test Methods" and Table "Test Methods of Initiating Devices."

F. Documentation: Comply with provisions in NFPA 731, Ch. 4, "Documentation."

G. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

H. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than 2 8 on Site for installation, inspection, startup, field testing, and instructing Owner's personnel in maintenance of equipment.

I. Equipment Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
2. Make final adjustments to equipment under direction of manufacturer's representative.

J. Furnish Installation Certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal occupancy hours for this purpose.

3.9 DEMONSTRATION

A. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

3.10 MAINTENANCE

A. Provide service and maintenance of intrusion detection system for from date of Substantial Completion.

END OF SECTION 283100

STATE OF NEW JERSEY DEPARTMENT OF TREASURY
DIVISION OF PROPERTY MANAGEMENT AND
CONSTRUCTION PO BOX 034, TRENTON, NJ 08625-0034

PROJECT#: A1349-00 Interior Construction, Renovation and Upgrades
State Office Building
135 West Hanover Street,
Trenton, Mercer County, N.J.

A/E: Lammey + Giorgio Architects

DATE: December 1, 2023

BULLETIN A

Bidder must acknowledge receipt of this Bulletin on bid form in the space provided therefor.

This Bulletin is issued for the purpose of amending certain requirements of the original Contract Documents, as noted hereinafter, and is hereby made part of and incorporated in full force as part of the Contract Documents. Unless specifically noted or specified hereinafter, all work shall comply with the applicable provisions of the Contract Documents.

A) DIANE B. ALLEN EQUAL PAY ACT

Pursuant to N.J.S.A. 34:11-56.14(b), any employer, regardless of the location of the employer, who enters into a contract with a public body to perform any public work for the public body shall provide to the Commissioner of the New Jersey Department of Labor and Workforce Development, through certified payroll records required pursuant to P.L.1963, c.150 (N.J.S.A. 34:11-56.25 et seq.), information regarding the gender, race, job title, occupational category, and rate of total compensation of every employee of the employer employed in the State in connection with the contract. The employer shall provide the commissioner, throughout the duration of the contract or contracts, with an update to the information whenever payroll records are required to be submitted pursuant to P.L.1963, c.150 (N.J.S.A. 34:11-56.25 et seq.).

Information regarding the Diane B. Allen Equal Pay Act and its requirements may be obtained from the New Jersey Department of Labor and Workforce Development (LWD) web site at:
https://nj.gov/labor/equalpay/equalpay.html

LWD forms may be obtained from the online web site at: https://nj.gov/labor/forms_pdfs/equalpayact/MW-562withoutfein.pdf

B) NOTICE OF EXECUTIVE ORDER 166 REQUIREMENT

Pursuant to Executive Order No. 166, signed by Governor Murphy on July 17, 2020, the Office of the State Comptroller ("OSC") is required to make all approved State contracts for the allocation and expenditure of COVID-19 Recovery Funds available to the public by posting such contracts on an appropriate State website. Such contracts will be posted on the New Jersey transparency website developed by the Governor's Disaster

Recovery Office (GDRO Transparency Website).

The contract resulting from this [RFP/RFQ] is subject to the requirements of Executive Order No. 166. Accordingly, the OSC will post a copy of the contract, including the [RFP/RFQ], the winning bidder's proposal and other related contract documents for the above contract on the GDRO Transparency website.

In submitting its proposal, a bidder/proposer may designate specific information as not subject to disclosure. However, such bidder must have a good faith legal or factual basis to assert that such designated portions of its proposal: (i) are proprietary and confidential financial or commercial information or trade secrets; or (ii) must not be disclosed to protect the personal privacy of an identified individual. The location in the proposal of any such designation should be clearly stated in a cover letter, and a redacted copy of the proposal should be provided. A Bidder's failure to designate such information as confidential in submitting a bid shall result in waiver of such claim.

The State reserves the right to make the determination regarding what is proprietary or confidential and will advise the winning bidder accordingly. The State will not honor any attempt by a winning bidder to designate its entire proposal as proprietary or confidential and will not honor a claim of copyright protection for an entire proposal. In the event of any challenge to the winning bidder's assertion of confidentiality with which the State does not concur, the bidder shall be solely responsible for defending its designation.

C) PROVISIONS FOR FEDERALLY FUNDED CONTRACTS

The Contractor must adhere to the following Federal Contracting Provisions as this Agreement is funded, in whole or in part, by Federal Funds, as required by 2 CFR 200.317, as applicable. See Statement of Assurances dated September 13, 2023 is attached to this Bulletin.

Contractors shall provide written certification to the DPMC that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award. Please see the Certification Regarding Lobbying and Disclosure of Lobbying Activities attached to the Statement of Assurances to be submitted prior to Contract Award.

The Federal CARES Act requires firms to certify prior to Contract Award that they are not a "Covered Entity" under that Act. Please see the Conflicts of Interest Certification attached to the Statement of Assurances to be submitted prior to Contract Award.

D) NJ SUPPLIER DIVERSITY MANAGEMENT SYSTEM (SDMS) FOR CONTRACT PAYMENTS

The State of New Jersey is implementing a new Supplier Diversity Management System (SDMS) to assist in managing its diversity programs including monitoring actual participation versus established contract goals. It is anticipated that this new SDMS will be implemented effective in November 2023. Therefore, after each invoice payment is made by the State/DPMC to the prime contractor, the prime contractor will be required as part of their contract requirements to electronically report and enter the appropriate subcontractor payments into the SDMS and have each subcontractor confirm receipt of the payment in the SDMS. The SDMS will allow the

State to monitor and verify actual subcontractor participation/utilization versus contract goals to better measure its performance against established diversity goals.

E) IMPORTANT CONTRACTOR INFORMATION – FEDERAL SYSTEM FOR AWARD MANAGEMENT (SAM REGISTRATION):

In accordance with N.J.S.A. 52:32-44.1, any firm seeking to be awarded a contract shall provide a written certification to DPMC that neither the firm nor the firm's affiliates are debarred at the federal level from contracting with a federal government agency. Please see the attached Certification of Non-Debarment Form to be submitted prior to Contract Award.

In addition, any firm seeking to be awarded a contract must register with the Federal System for Award Management (SAM) prior to contract award. In order to comply with this requirement, firms must register in SAM at http://www.sam.gov and DPMC will verify the firm's registration in SAM prior to contract award.

F) EMPLOYEE MISCLASSIFICATION

In accordance with Governor Murphy's Executive Order #25 and the Task Force's July 2019 Report, employers are required to properly classify their employees. Workers are presumed to be employees and not independent contractors, unless the employer can demonstrate all three factors of the "ABC Test" below:

A. Such individual has been and will continue to be free from control or direction of the performance of such service, but under his or her contract of service and in fact; and

B. Such service is either outside the usual course of business for which such service is performed, or that such service is performed outside of all places of business of the enterprise for which such service is performed; and

C. Such individual is customarily engaged in an independently established trade, occupation, profession or business.

These factors have been adopted by New Jersey under its Wage & Hour, Wage Payment and Unemployment Insurance Laws to determine whether a worker is properly classified. Under N.J.S.A. 34:1A-1.17 to 1.19, the Department of Labor and Workforce Development has the authority to investigate potential violations of these laws and issue penalties and stop work orders to employers found to be in violation of the laws.

G) NOTICE OF POST-BID MEETING:

a. After the bids are received and opened, the Apparent Low Bidder is required to attend a Post- Bid meeting at the State's offices at the date, time and location listed herein.

b. The Apparent Low Bidder must bring the following to the Post-Bid meeting concerning the work they are performing by their own forces:

i. The itemized estimate used in preparation of the bid submission; and
ii. The estimator, or other authorized person who can discuss the itemized estimate; and

iii. An employee of the company who is authorized to sign the Post-Bid Review meeting minutes.

c. Each of the Apparent Low Bidder's "Named Sub-Contractors" must attend the meeting and bring the following concerning the work they are performing by their forces:
   i. The itemized estimate used in preparation of the bid submission; and
   ii. The estimator, or other authorized person who can discuss the itemized estimate;

d. A Post-Bid meeting will be held (tentative and to be confirmed after bids are reviewed):

DATE: TBD
TIME: 10:00 AM
LOCATION: DPMC, 20 W State St, Trenton, NJ or Teleconference

H) AMENDMENTS TO THE INSTRUCTIONS TO BIDDERS & GENERAL CONDITIONS OF THE CONTRACT

Amend the Instructions to Bidders of the Contract as follows:

IB 1 BID PROPOSALS

Replace IB 1.5 in its entirety with the following:

IB 1.5 Bid proposals based upon the plans, specifications, general, special and supplementary conditions and bulletins shall be deemed as having been made by the bidder with full knowledge of the conditions therein. Bidders are required to visit the site prior to submitting proposals for the work herein described, and to have thoroughly examined the conditions under which the contract is to be executed, including those reasonably observable conditions of the premises which would hinder, delay, or otherwise affect the performance of the contractor required under the terms of the contract. The State will not allow claims for additional costs as a result of the contractor's failure to become aware of the reasonably observable conditions affecting its required performance. The bidder is required to make appropriate allowances in the preparation of the bid for the accommodation of such conditions. Bidders must warrant in the bid documents that the bidder is familiar with conditions existing at the site at the time the bid is submitted.

Replace IB 1.8 in its entirety with the following:

The bidder must include in the bid envelope: (1) the proposal signed by the bidder, (2) the executed affidavit of non-collusion and (3) bid security as further described in Section IB6.

Replace IB 1.11 in its entirety with the following:

a. MacBride Principles - Pursuant to N.J.S.A. 52:34-12.2, a bidder must certify prior to contract award to attest, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates pursuant to N.J.S.A. 52:34-12.2, that the bidder has no ongoing business activities in Northern Ireland and does not maintain a physical presence therein through the operation of offices, plants, factories, or similar facilities, either directly or indirectly, through intermediaries, subsidiaries or affiliated companies over which it maintains effective control; or will take lawful steps in good faith to conduct any business

operations it has in Northern Ireland in accordance with the MacBride principles of nondiscrimination in employment as set forth in N.J.S.A. 52:18A-89.8 and in conformance with the United Kingdom's Fair Employment (Northern Ireland) Act of 1989, and permit independent monitoring of their compliance with those principles. If a contractor who would otherwise be awarded a contract or agreement does not certify, then the Director may determine, in accordance with applicable law and rules, it is in the best interest of the State to award the contract or agreement to the next responsible bidder who has completed the certification. If the Director finds the contractor to be in violation of the principles which are the subject of this law, s/he shall take such action as may be appropriate and provided for by law, rule or contract, including, but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the contractor in default and seeking debarment or suspension of the contractor. Upon signing the contract, the bidder certifies that it abides by the MacBride Principles.

b. Investment Activities in Iran - Pursuant to N.J.S.A. 52:32-55, et seq., any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must provide, prior to the time a contract is awarded or renewed, a certification on the DPMC form provided to attest, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of Treasury's Chapter 25 list as a person or entity engaging in investment activities in Iran. The Chapter 25 list is found on the Division of Purchase and Property's website at www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf. Bidders must review this list prior to completing the certification. If the Director finds a person or entity to be in violation of law, s/he shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party. This form must be submitted by the bidder prior to contract award.

IB 2 BID MODIFICATIONS

Replace IB 2.1 in its entirety with the following:

IB 2.1 A bidder may modify its bid proposal by electronic mail or letter at any time prior to the scheduled closing time for receipt of bids, provided such communication is received by the DPMC prior to such closing time. A mailed confirmation of any modification signed by the bidder must have been mailed and time-stamped by the US Postal Service, Fedex, UPS, etc. prior to the specified closing time. Such confirmation, whether transmitted electronically or by mail, shall be accompanied by a newly executed affidavit of non-collusion.

Replace IB 2.2 in its entirety with the following:

IB 2.2 Communications shall not reveal the basic bid price but shall only provide the amount to be added, subtracted or modified so that the final prices or terms will not be revealed until the sealed proposal is opened. If written confirmation of the modification is not received within two working days after the scheduled closing time, no consideration will be given to the modification.

IB 3 CONSIDERATION OF BIDS

Replace IB 3.1, Items c and d in its entirety with the following:

c. The Director reserves the right to waive any bid requirements where such waiver is permitted by law. Such waiver shall be at the sole discretion of the Director.

d. The Director reserves the right to reject any and all bids, in accordance with applicable law, when such rejection is in the best interests of the State. The Director also may reject the bid of any bidder which, in the Director's judgment, is not responsible or capable of performing the contract obligations based on financial capability, past performance, or experience. A bidder whose bid is so rejected may request a hearing before the Director by filing a written notice.

IB 4 AWARDS

Replace IB 4.5, in its entirety with the following:

IB 4.5 The successful bidder and all of its subcontractors are required to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 et seq., regarding Equal Employment Opportunity in Public Works Contracts.

IB 5 QUALIFICATION OF BIDDERS

Replace IB 5.1 in its entirety with the following:

IB 5.1 If the successful bidder is a corporation not organized under the laws of the State of New Jersey or is not authorized to do business in this State (foreign corporation), the award of the contract shall be conditioned upon the prompt filing by the said corporation of a certificate to do business in this State and complying with the laws of this State in that regard. This filing must be made with the Division of Revenue and Enterprise Services. No award of contract will be made until the Division of Revenue and Enterprise Services confirms this authorization.

Replace IB 5.2 in its entirety with the following:

IB 5.2 The DPMC requires that each contractor, except in the case of a single contractor, shall perform a minimum of 35 percent of the contract work by the contractor's own forces. However, the Director has the sole discretion to reduce this percentage depending upon the nature and circumstances in any particular case, if the Director determines that to do so would be in the best interests of the State, and provided that the bidder submits a written request with the original bid proposal.

Replace IB 5.5 in its entirety with the following:

IB 5.5 At the time of the bid due date, the bidder and the subcontractors must be registered in accordance with "The Public Works Contractor Registration Act", N.J.S.A. 34:11-56.48, *et seq.* All questions regarding registration shall be addressed to:

Contractor Registration Unit

New Jersey Department of Labor &
Workforce Development
Division of Wage & Hour Compliance
P O Box 389
Trenton NJ 08625-0389
Telephone: 609-292-9464

FAX: 609-633-8591

Replace IB 5.6 in its entirety with the following:

IB 5.6 In accordance with N.J.S.A. 52:32-44 all contractors and subcontractors providing goods/services to State agencies and authorities are required to provide the contracting agency or authority with proof of registration with the Department of the Treasury, Division of Revenue and Enterprise Services. The basic registration process involves the filing of Form NJ-Reg., which can be filed online at www.state.nj.us/njbgs/services.html or by calling (609) 292-7077 or (609) 292-1730. The bidder and subcontractors must submit a valid Business Registration Certificate prior to contract award.

Pursuant to N.J.S.A. 54:49-4.1, firms who fail to provide a copy of a Business Registration or who provide false information of business registration under the requirements of N.J.S.A. 52:32-44, shall be liable for a penalty of $25 for each day of violation, not to exceed $50,000 for each business registration copy not properly provided under a contract with DPMC.

IB 8 BULLETINS AND INTERPRENTATIONS

Replace IB 8.2 in its entirety with the following:

IB 8.2 Every request for an interpretation relating to clarification or correction of the plans, specifications, or other bid documents must be made in writing, addressed to the architect/engineer and the DPMC Director, and must be received at least five (5) working days prior to the date fixed for the opening of the bids. Any and all interpretations, clarifications or corrections and any supplemental instructions must be issued by the Director in the form of written bulletins and mailed by certified mail, return receipt requested, or by electronic notice to all prospective bidders not later than three (3) working days prior to the date of the opening of bids. All bulletins issued shall become part of the contract documents and must be acknowledged in all bid proposals.

IB 12 OFFER OF GRATUITIES

Replace IB 12.1, Items a, b and f in their entirety with the following:

a. No vendor shall pay, offer to pay, or agree to pay, either directly or indirectly, any fee, commission, compensation, gift, gratuity, or other thing of value of any kind to any State officer or employee or special State officer or employee, as defined by N.J.S.A. 52:13D-13b. and e., in the Department of the Treasury or any other agency with which such vendor transacts or offers or proposes to transact business, or to any member of the immediate family, as defined by N.J.S.A. 52:13D-13i., of any such officer or employee, or any partnership, firm, or corporation with which they are employed or associated, or in which such officer or employee has an interest within the meaning of N.J.S.A. 52:13D-13g.

b. The solicitation of any fee, commission, compensation, gift, gratuity or other thing of value by any State officer or employee or special State officer or employee from any State vendor shall be reported in writing forthwith by the vendor to the Attorney General and the State Ethics Commission.

f. The provisions cited above in paragraphs IB12.1.a. through e. shall not be construed to prohibit a State officer or employee or special State officer or employee from receiving gifts from or contracting with vendors under the same terms and conditions as are offered or made available to members of the general public subject to any guidelines the State Ethics Commission may promulgate under paragraph IB12.1.c. above.

Amend the General Conditions of the Contract as follows:

ARTICLE 1 – GENERAL PROVISIONS

1.5 ASSIGNMENTS

Delete 1.5 in its entirety and replace with the following:

The Contractor shall not assign all or any part of this Contract without the written consent of the Director. Money due (or to become due) the Contractor hereunder shall not be assigned for any purpose whatsoever.

ARTICLE 4 – THE CONTRACTOR

4.1 REVIEW OF THE CONTRACT DOCUMENTS AND FIELD CONDITIONS

Delete 4.1.1 in its entirety and replace with the following:

The Contractor shall thoroughly examine and be familiar with all of the Contract Documents and the Site. The Contractor shall investigate and accurately determine the nature and location of the Work, the current building equipment and systems, labor and material conditions, and all matters which may in any way affect the Work or its performance.

4.3 PERMITS, LAWS, AND REGULATIONS

Delete 4.3.1 in its entirety and replace with the following:

The DPMC will obtain and pay for the construction permits and inspections (building, plumbing, electrical, elevator and fire), required by the Department of Community Affairs (DCA). When permits are issued by DCA, the appropriate licensed Contractors and/or Subcontractors shall be required to fill out the Contractor section of the Sub-Code Technical Section and sign and affix their raised seal thereto.

Delete 4.3.7 in its entirety and replace with the following:

The Contractor shall perform all sewerage disposal work in conformance with the regulations of the State's Department of Environmental Protection.

Delete 4.3.9 in its entirety and replace with the following:

Consistent with section 4.4 and 4.5 of these General Conditions, the Contractor shall be responsible for its own actions and protect, defend and indemnify the State from all fines, penalties or loss incurred for, or by reason of, the violation of any municipal ordinance or regulation or law of the State while the said work is in progress.

Delete 4.3.13 in its entirety and replace with the following:

The Contractor shall establish an approved Silica Health and Safety Program when tasks generating crystalline silica dust are being performed. This program shall include engineering, work practice, and respiratory protection controls to reduce worker exposure to airborne respirable crystalline dust to levels that are as low as reasonably achievable. When tasks are performed that generate airborne crystalline dust, the Contractor will minimize worker exposure to dust by one, or a combination of the following methods:1) dust suppression with water, 2) local exhaust ventilation to a high-efficiency dust collector, and/or 3) appropriate respiratory protection devices. The Contractor shall provide a trained, competent person, as defined by OSHA 29 CFR 1926, on site at all times to implement the Silica Health and Safety Program when tasks generating crystalline silica dust are being performed.

4.4 RESPONSIBILITY FOR THE WORK

Delete 4.4.2 in its entirety and replace with the following:

The Contractor shall be responsible for all damage or destruction caused directly or indirectly by its operations to all parts of the Work, both temporary and permanent, and to all adjoining property at no cost to the State.

4.9 EXCAVATIONS, CUTTING AND PATCHING

Delete 4.9.1 in its entirety and replace with the following:

Soil borings, test pits or other subsurface information may be secured by an independent contractor retained by the State prior to design and construction of the Project and, if obtained, may be included in the Contract Documents for the Contractor's use. The Contractor assumes full responsibility for interpretation of said information.

4.11 EQUIPMENT AND MATERIALS

4.11.5 Delete the second sentence - *Wherever practicable, preference shall be given at all times to material and equipment manufactured or produced in the State of New Jersey, where such preference is reasonable and will best serve the interest of the State.*

4.12 TEMPORARY FACILITIES

Delete 4.12.5, Item a in its entirety and replace with the following:

a. The Contractor shall be responsible for providing and maintaining unobstructed traffic lanes on the designated construction access routes shown on the Contract Drawings or as reasonably required so as to perform the Work. The Contractor shall provide and maintain all reasonably required safety devices. The Contractor shall provide any necessary additional materials, grading and compaction, and shall remove snow and debris as necessary to provide and maintain the access roadway and pedestrian ways in serviceable condition.

4.15 PROTECTION/SAFETY

Delete 4.15.2, Item c in its entirety and replace with the following:

The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including but not limited to rails, night-lights, aircraft warning lights, the posting of danger signs and other warnings against hazards, promulgating safety regulations, notifying owners and users of adjacent utilities and other means of protection against accidental injury or damage to persons and property.

4.18 PROJECT SIGN

Delete 4.18 in its entirety

Add the following paragraphs and sub-paragraphs:

4.18.1 SIGNS AT THE PROJECT SITE

4.18.1.1 The Contractor is not required to provide a project sign.

4.18.1.2 Signs provided by others will not be permitted at the site.

4.20 DPMC FIELD OFFICE

Delete 4.20.1 in its entirety and replace with the following language:

A separate on-site field office for the use of DPMC personnel is not required for this project.

Delete 4.20.2 in its entirety and replace with the following language:

If required, a separate on-site field office for the use by the Contractor is specified elsewhere in the construction documents.

4.21 PHOTOGRAPHS

Delete 4.21.1 in its entirety and replace with the following language:

The Contractor shall submit pre-construction photographs and videos and monthly progress photographs in duplicate to the DPMC, giving six (6) views of the Work with each application for payment until the Project is completed.

ARTICLE 5 - SUBCONTRACTORS

5.1 SUBCONTRACTORS AND MATERIAL SUPPLIER APPROVALS

Delete 5.1.1 in its entirety and replace with the following:

Upon their execution, but not less than fourteen (14) calendar days prior to Subcontractor mobilization on the site, and/or Subcontractor billing, the Contractor shall forward to the Architect/Engineer on the form provided by the DPMC the names of all its Subcontractors and suppliers, of such others as the DPMC may direct, proposed to perform the principal parts of the Work. The Contractor shall forward the appropriate DPMC form to the Architect/Engineer for approval. Department of Labor and Workforce Development Public Works Contractor Registration and New Jersey Business Registration Certificate are required for all Subcontractors.

Delete 5.1.2 in its entirety and replace with the following:

If the DPMC has objection to any proposed or approved material supplier, the Contractor shall substitute another material supplier acceptable to DPMC. Under no circumstances shall the State be obligated for additional cost due to such substitution.

5.2 CONTRACTOR-SUBCONTRACTOR RELATIONSHIP

Delete 5.2.3 in its entirety

ARTICLE 6 - CONSTRUCTION PROGRESS SCHEDULE
Revise Article 6 as follows:

6.1 GENERAL

Delete 6.1 in its entirety and replace with the following:

The Contractor shall be required to provide Graphic Format progress schedules, as defined in section 6.4 below.

6.2 CONSTRUCTION PROGRESS SCHEDULE (CRITICAL PATH METHOD - CPM CONSULTANT RETAINED BY THE STATE).

Delete 6.2 in its entirety:

6.3 CONSTRUCTION PROGRESS SCHEDULING PROVIDED BY THE CONTRACTOR. Delete

6.3.1 in its entirety and replace with the following language:

6.3.1 Schedule Format: The contractor shall be responsible for preparing, updating and distributing a Gantt chart progress schedule constructed using either Microsoft Project or a Microsoft Project compatible software ["Schedule"] for the project work in accordance with this Sub- paragraph.

6.3.1.1The Schedule must be furnished as a Microsoft Project file and in paper format if required.

6.3.2 Requirements for what is included in the Schedule: The Schedule shall fully describe the project work in sufficient detail to satisfy the architect/ engineer and the Director.

6.3.2.1 The Schedule must be accurate in its depiction of all project activities.

6.3.2.2 The Schedule shall, at a minimum, indicate in suitable detail, all significant features of the work or work activities to be performed, including the placing of orders and anticipated delivery dates for critical items, dates for submissions and approvals of submittals and shop drawings, all change order work , all necessary inspections, the beginning and time duration for all tasks, predecessors and successors for each task , contract milestones, , the NTP, the dates of substantial and final completion of the work and significant Agency or State milestones, when applicable.

6.3.2.3 The Schedule must show the project's critical path.

6.3.2.4 The contractor may be required to add other information to the Schedule including, but not limited to, costs and resources.

6.3.2.5 The Schedule must show the durations in calendar day and acknowledge weekends and State holidays as non-working days, unless otherwise required by the contract.

6.3.2.6 *The Schedule must show the date of Substantial Completion occurring on or before the contract duration end date unless otherwise approved by the architect / engineer and the Director.*

6.3.3 The Schedule as the project record: The contractor agrees that the Schedule shall constitute the official historical record of project's progress.

6.3.4 Approved Schedule: All references herein to the Schedule shall mean a Schedule that is approved by the Project Team including, but not limited to the architect/engineer and the Director.

6.3.4.1 The architect/engineer or Director can request the addition of information to the schedule when it is, in their opinion, necessary to better describe the contractor's work effort prior to granting their approval.

6.3.5 Complying with the Schedule: The contractor shall furnish sufficient labor, materials and equipment to ensure the prosecution of the work in accordance with the Schedule.

6.3.6 Recovery Schedule: The contractor is required to provide a recovery schedule if the completion time for any task deemed necessary for Substantial Completion is not scheduled to be complete prior to the

contract duration allotted in the contract.

6.3.6.1 To create the recovery schedule the contractor shall, among other things, revise the sequence of tasks and /or the time for performance of tasks through concurrent operations, additional manpower or, when allowable, overtime or additional shifts etc. until it is assured that Substantial Completion will occur on or before the contract completion date.

6.3.6.2 The State will not allow any additional charges for work performed or made necessary in order for the contractor to comply with the dates shown in the recovery schedule i.e. no additional charges will be allowed the contractor for overtime, additional manpower, equipment, additional shifts, etc., except as provided for elsewhere in the contract.

6.3.6.3 The contractor is required to perform in accordance with the tasks and durations as shown in the recovery schedule including meeting the dates shown for Substantial and Final Completion.

6.3.3.4 The recovery schedule must comply with all requirements of this section and all references to and requirements for the Schedule shall also apply to the recovery schedule.

6.3.7 Submission and review requirements for the project schedule:

6.3.7.1 The contractor must submit and obtain approval of the initial schedule within 30 days after the Notice to Proceed, but in no case later than the first application for payment.

6.3.7.2 Subsequently the contractor must update and submit the project schedule immediately upon the occurrence of a change in an activity or event that may, in the architect's/engineers/s opinion, significantly change the current approved schedule, but at a minimum the schedule must be updated every two weeks and submitted at the bi-weekly progress meeting.

6.3.7.3 The updated schedule must include any activities that were added for any reason including, but not limited to change order work approved to date.

6.3.7.4 The updated progress schedule shall include the progress achieved for each activity that was scheduled including the actual dates the work was started and completed.

6.4.7.5 The project schedule shall be reviewed in detail at every bi-weekly progress meeting.

6.3.7.6 The absence of bi-weekly meetings does not relieve the contractor of his obligation to provide a schedule every two weeks.

6.3.7.7 The architect/engineer or Director reserves the right to cancel or reschedule the bi- weekly meeting or otherwise take preemptive action if the contractor does not have an approved progress schedule ready for submission as described herein.

6.3.8 Schedules and payments or extensions of time:

6.3.8.1 The contractor will make no claim for, and have no right to, additional payment or extension of time for completion of the work in accordance with the schedule, or any other concession because of any misinterpretation or misunderstanding on the contractor's part of the project schedule, or

because of any failure on the contractor's part to become fully acquainted with all conditions relating to the project schedule and the manner in which it will be used on the project, or because of any other contractor's failure to properly participate in the development of a schedule or to perform the contract in accordance with the schedule.

6.3.8.2 A copy of the current, updated and approved schedule is a required attachment to each application for payment.

6.3.8.3 Failure to include a copy of the current, updated and approved schedule with the payment request shall be cause for rejection of the progress payment request.

6.3.9 Two week look ahead/look behind work plan: In addition to the project schedule requirements, the contractor is required to submit a two week look ahead/look behind work plan at every bi-weekly project meeting.

6.3.9.1 The work plan shall focus on the activities that have been completed in the last two weeks and those planned for the next two weeks.

6.3.9.2 The work plan shall be in greater depth than the overall project schedule.

6.3.9.3 The work plan shall identify the contractor's activities that impact the operations and occupants of the State building or facility of the subject project.

6.3.9.4 The work plan shall be a subset of the current schedule and all activities shall coordinate between them.

6.3.9.5 The absence of a bi-weekly meeting shall not relieve the contractor of his responsibility to provide this work plan.

6.3.9.6 This work plan is in addition to and not in lieu of the schedule requirements described in Sub-paragraph 6.4 et al.

6.3.10 The Contractor agrees that no time extension will be granted for time lost due to normal seasonal weather conditions. In order to qualify for consideration for a time extension due to adverse weather conditions, it must be shown by clear and convincing evidence that the weather conditions during a given quarterly period (summer, fall, winter, spring) were more severe than the previous five-year (5) average for the Project geographical area, and that these weather conditions critically impacted the final Project completion date by delaying the performance of work. If abnormal weather losses can be shown to have impacted the Project completion date, a non-compensable time extension will be considered for that portion of the proven weather-related delays, which exceeded normal weather losses that should have been anticipated for the quarterly period in question.

6.3.11 The "Construction Duration" identified on the Bid Proposal Form shall be from the Notice to Proceed to Substantial Completion.

ARTICLE 7 – TIME OF COMPLETION

7.5 DELAY, DISRUPTION AND INTERFERENCE

Delete 7.5.2, Contractor's Damage for Delay, Disruption or Interference in its entirety and replace with the following:

The Contractor shall not be entitled to recovery of money damages from the DPMC caused by delay, disruption or interference with the Contractor's Work except as expressly provided under section 7.5.2 of these General Conditions paragraph. The Contractor expressly agrees that the Contractor's remedy for delay, disruption of interference shall be limited to an extension of time only and that there shall be no recovery of money damages by the Contractor for any delay, disruption or interference with the Contractor's work attributable to any cause whatsoever (other than the State's negligence, bad faith, active interference or other tortious conduct). The Contractor expressly agrees that it shall not be entitled to recover damages due to delay, disruption or interference caused by any of the following:

a. Delayed execution of the contract or any of the causes referenced in paragraph 7.5.2;

b. Any act or omission by any party other than the State, including, but not limited to, the Architect-Engineer, any other Contractor or Subcontractor, any CPM or other consultant retained by the State, any construction manager retained by the State, any agency or instrumentality of the federal government or of any local governmental entity or any utility (e.g., gas, electric, telephone, cable);

c. Any act or omission of any agency or instrumentality of the State , other than the DPMC, including, without limitation, the Department of Environmental Protection and the Department of Community Affairs;

d. Weather;

e. Subsurface conditions of any type including, without limitation rock and underground utilities, whether or not such conditions were reasonably ascertainable to the Contractor at the time of bidding;

f. Use of all or any portion the Project premises prior to completion of the Work to the extent that such use is permitted under the terms of the Contract;

g. Delay in obtaining any permit or approval;

h. Delay caused by the issuance of any court order, injunction or restraining order;

i. Any delay which does not entitle the Contractor to an extension of the Contract Completion Time under Section 6.2.8 of these General Conditions; or

j. Delay attributable to any other cause, other than a cause for which the State is legally restricted from enforcing a contractual "no damage for delay" clause under N.J.S.A. 2A:58B-3 or any other provision of law restricting or barring the enforcement of such clauses.

In interpreting this provision, the negligence or other wrongful conduct of others, including, without limitation, the Architect/Engineer, the CPM consultant, any construction management firm and any other firm or person retained by the State shall not be imputed to the State. Further, to the extent that the Contractor is entitled to recover monetary damages for delay under this Contract, such recovery shall be limited to actual direct costs incurred on account of the delay, and shall not include profit or other markup on such costs, home office overhead calculated under the Eichleay formula or any other kind of consequential or indirect cost or damage, including but not limited to any alleged cost or damage under the total cost method, the modified total cost method, or productivity factors (costs for inefficiency based on industry productivity factors such as those provided by the Mechanical Contractors Association of America (MCAA) Factors Affecting Labor Productivity).

ARTICLE 9 – PAYMENTS

9.1 INVOICES

Delete 9.1.5, Item a in its entirety and replace with the following:

a. A proper invoice will be deemed to have been received by the Owner when it is received by the person or entity designated by the State to review and sign the invoice on the State's behalf at the address designated in the pre-construction conference for receipt of invoices. Receipt of an invoice by such person or entity shall commence the running of the 20-day period for formal approval and certification as provided under N.J.S.A. 2A:30A-2(a);

Delete 9.1.6 in its entirety and replace with the following:

The provisions of this Article 9 shall not govern the State's payment obligations nor shall they supersede or modify any other contractual provision allowing the withholding of monies from the contractor to the extent that the contractor has not performed in accordance with the provisions of the contract. Nor shall this Article 9 govern the State's payment obligations nor supersede or modify any other contractual provision governing Contractor claims for additional compensation beyond the base contract price and approved change orders.

9.2 INTEREST

Delete 9.2.2 in its entirety and replace with the following:

Interest may be paid by separate payment to the Contractor, but shall be paid within thirty (30) calendar days of payment of the principal amount of the approved invoice.

Delete 9.2.3 in its entirety and replace with the following:

Nothing in this Article 9 shall be construed as entitling the Contractor to payment of interest on any sum withheld by the State for any reason permitted under the Contract or applicable law, or on any claim for additional compensation, over and above sums due under the base Contract or approved change orders.

9.8 MISCELLANEOUS

Delete 9.8.1 in its entirety and replace with the following:

Disputes regarding nonpayment of a Contractor's invoice under this Article 9 may be submitted to non-binding Alternative Dispute Resolution (ADR) upon mutual agreement of the State and the Contractor. In such event, the State and the Contractor shall share equally the fees and expenses of the selected mediator, arbitrator, umpire or other ADR neutral. Provided, however, that nothing herein shall be construed, in whole or in part, as a waiver, release or modification of the provisions of the New Jersey Contractual Liability Act, N.J.S.A. 59:13-1, et seq., which governs claims against the DPMC.

ARTICLE 13 – OTHER REQUIREMENTS

13.1 PREVAILING WAGE

Delete 13.1.1, Item a, 2 in its entirety and replace with the following:

(2) At the time of the bid due date, the Bidder and any Subcontractors identified by the Bidder must be registered in accordance with "The Public Works Contractor Registration Act" (N.J.S.A. 34:11-56.48 et seq.) All questions regarding registration shall be addressed to:

Contractor Registration Unit
New Jersey Department of Labor and Workforce Development
Division of Wage & Hour Compliance
P O Box 389
Trenton NJ 08625-0389
Telephone: 609-292-9464
FAX: 609-633-8591

13.4 INSURANCE

Rename 13.4.1, Item b: "Business/Commercial Automobile Liability":

I) REVISIONS AND/OR CLARIFICATIONS TO THE DRAWINGS, SPECIFICATIONS AND/OR PROJECT REQUIREMENTS;

1. UCC Permits have been paid by the State.

2. All Technical Sections that reference manufacturers and products are hereby revised to include "Or Approved Equal." Technical Sections of the Specifications have not been reissued as part of this Bulletin A.

3. "Approved Equal" requests must be presented in writing during the Question and Answer period of the

Bid Phase, after which they will not be considered. The Question and Answer period will be provided by the DPMC during the bid phase or announced at the Pre-Bid Meeting. A response will be provided by the Consultant via Bulletin.

4. As it relates to testing and inspections, all testing and inspections indicated in the specifications shall be performed by a DPMC prequalified firm and arranged and paid for by the Contractor and in no situation by the Owner.

5. INSTALLER, MANUFACTURER & FABRICATOR QUALITY ASSURANCE & QUALIFICATIONS: Eliminate any and all references to "Installer" and/or "Fabricator" quality assurance requirements which specifically pertain to stated minimum required experience in years and number of previous projects. All other requirements for QA/QC, including but not limited to compliance with relevant codes, standards, and manufacturer installation instructions remain applicable.

6. Delete any and all references to "Supplemental General Conditions" and "Special Conditions".

7. The Investment Activities in Iran Form is attached to this Bulletin. The apparent low bidder will be required to submit this form prior to Contract Award.

8. This project is subject to a Project Labor Agreement (PLA). See attached sample PLA for this project.

9. Wherever there is a reference to AISC Certification: neither the Contractor nor the Fabricator is required to be AISC Certified, but all related work must conform to the AISC Standards referenced in the currently adopted building code.

10. Table of Contents, TC, delete in its entirety and replace with "TC-Revised" attached to this bulletin.

11. Drawing Sheet G001, delete in its entirety and replace with the revised G001 attached to this bulletin.

12. Drawing Sheet S-001, General Construction note #11, delete "Unless explicitly noted 'Issued for Bid'".

13. Drawing Sheets A110, A111, A112, A113 & A303, delete the wording in note C53 in its entirety and replace it with the following: Patch and Paint interior plaster finish of hoistway walls between T.O. Pit Slab Level and First Floor Level.

14. Drawing Sheets A114, A115, A116, A117, A118, A119, delete note C53 in its entirety.

15. Delete all references in its entirety to specification section 012900 Payment Procedures.

16. Delete all references in its entirety to specification section 033000 Cast-In-Place Concrete.

17. Delete all references in its entirety to specification section 099600 High Performance Coatings.

18. Delete all references in its entirety to specification section 099113 Exterior Painting.

19. Delete all references in its entirety to specification section 270528 Pathways for Communication Systems.

20. Delete all references in its entirety to specification section 280528.29 Hangers and Supports for Electronic Safety and Security.

21. Specification section 011000-1.5-C, revise to read, Substantial Completion is required within 351 consecutive calendar days from receipt of Notice to Proceed.

22. Specification section 013200-1.10, delete in its entirety.

23. Specification Section 015000-A-2.2-B, delete in its entirety.

24. Specification section 017419-3.3-A-2, delete in its entirety.

25. Specification section 087100-1.4-G, delete wording *Conduct conference to comply with requirements in Division 01 Section "Project Meetings".*

26. Specification section 087113-1.2-B-2, delete reference to Division 08 Aluminum Framed Entrances.

27. Specification section 096813-3.1-D-1, delete in its entirety.

28. Specification section 142123-2.01-F, delete in its entirety.

29. Specification section 142123-4, 1.08, C, Delete in its entirety.

30. Specification section 221413-3.6-C-2, delete in its entirety.

31. Specification section 230548-1.4-A-2-b, delete in its entirety.

32. Specification section 230901 Variable Frequency Drives has been added and is attached to this bulletin.

33. Specification section 261116.11-19, 3.7, A, Delete the phrase "if requested by Owner,"

34. Specification section 262816-3.5-B, delete reference to specification section 260573 Overcurrent Protective Device Coordination Study.

35. Specification section 262933-3.4-A, delete reference to specification section 260523 Control-Voltage Electrical Power Cables and replace with specification section 262933 Controllers For Fire-Pump Drivers.

36. Specification section 270529-1.1-B-1, delete reference to specification section 270548 Seismic Controls for Communication Systems.

37. Specification section 270536-1.1-B-1, delete reference to specification section 260536 Cable Trays for Electrical Systems.

38. Specification section 271323-3.6-C, delete reference to specification section 271523 Communications Optical Fiber Horizontal Cabling.

39. Specification section 260543 Underground Ducts and Raceways for Electrical Systems has been added and is attached to this bulletin.

40. Specification section 033543 Polished Concrete Finishing, delete in its entirety.

41. Specification section 035300 Polished Concrete Floor Toppings has been added and is attached to this bulletin.

42. Specification section 101423 Panel Signage has been added and is attached to this bulletin.

43. Contact information for Electric and Gas Utilities, Public Service Electric and Gas, Craig Smith (609) 780-6859, craig.smith@pseg.com, PO Box 14444 New Brunswick NJ 08906 4444 and is attached to this bulletin.

44. Contact information for Water Utility, Trenton Water Works, PO Box 70226 Philadelphia, PA 19176 0220 and is attached to this bulletin.

ATTACHMENTS:

1. Certification of Non-Debarment Form
2. Investment Activities in Iran Form
3. Sample Project Labor Agreement (PLA)
4. Statement of Assurances dated September 13, 2023
5. Certification Regarding Lobbying & Disclosure of Lobbying Activities Form
6. Conflicts of Interest Certification Form
7. Revised Specification Table of Contents.
8. Specification section 035300 Polished Concrete Floor Toppings.
9. Specification section 101423 Panel Signage.
10. Specification section 230901 Variable Frequency Drives.
11. Specification section 260543 Underground Ducts and Raceways for Electrical Systems.
12. Existing Utility Company Contact Information.
13. Revised Drawing G001 dated September 26, 2023.

END OF BULLETIN A

NEW JERSEY DEPARTMENT OF THE TREASURY

DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION

CERTIFICATION OF NON-DEBARMENT FORM

DPMC Contract No: _____

Contract Name: _____

Contractor Name: _____

Contractor Address: _____

CERTIFICATION

Pursuant to N.J.S.A. 52:32-44.1, I, the undersigned, being duly authorized to complete this certification on behalf of the above-named Contractor, do hereby certify and attest, under the pains and penalties of perjury, that:

- The Contractor is not debarred at the federal level from contracting with the federal government;
- None of the parent entities, subsidiaries, related entities or affiliates of the Contractor are debarred at the federal level from contracting with the federal government;
- I am authorized to execute this certification on behalf of the Contractor;
- I acknowledge that the State of New Jersey is relying on the information contained herein;
- I acknowledge that I am under a continuing obligation from the date of this certification through the completion of any contract(s) with DPMC to notify DPMC in writing of any changes to the information contained herein; and
- I acknowledge that it is a criminal offense to make a false statement or misrepresentation in this certification. If I do so, I will be subject to criminal prosecution, and such misrepresentation may be considered fraudulent, and/or a material breach of the Contractor's contract(s) with the State of New Jersey.

If DPMC finds a person or entity to be in violation of the law, it shall take action as may be appropriate and permitted by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and/or seeking debarment or suspension of the party.

Signature: _____

Print Name: _____

Title: _____

Date: _____

DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN FORM

BID SOLICITATION # AND TITLE: _____

BIDDER NAME: _____

Pursuant to N.J.S.A. 52:32-57, et seq. (P.L. 2012, c.25 and P.L. 2021, c.4) any person or entity that submits a bid or proposalor otherwise proposes to enter into or renew a contract with the State of New Jersey must certify that neither the person nor entity, nor any of its parents,subsidiaries, or affiliates, is identified on the New Jersey Department of the Treasury's Chapter 25 List as a person or entity engaged in investment activities in Iran. The Chapter 25 list is found at https://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf. Bidders must review this list prior to completing the below certification. If the Director of the Division of Property Management and Construction finds a person or entity to be in violation of the law, s/he shall take action as may be appropriate and provided by law, rule or contract, including but not limited to; imposing sanctions, seeking compliance, recovering damages, declaring the party in default and/or seeking debarment or suspension of the party.

CHECK THE APPROPRIATE BOX

☐ I certify, pursuant to N.J.S.A. 52:32-57, et seq. (P.L. 2012, c.25 and P.L. 2021, c.4), that neither the Bidder listed above nor any of its parents, subsidiaries, or affiliates is listed on the New Jersey Department of the Treasury'sChapter 25 List of entities determined to be engaged in prohibited activities in Iran.

OR

☐ I am unable to certify as above because the Bidder and/or one or more of its parents, subsidiaries, or affiliates is listed on the New Jersey Department of the Treasury's Chapter 25 List. I will provide a detailed, accurate and precise description of the activities of the Bidder, or one of its parents, subsidiaries or affiliates, has engaged in regarding investment activities in Iran by completing the information requested below.

Entity Engaged in Investment Activities _____
Relationship to Bidder _____
Description of Activities _____
_____
Duration of Engagement _____
Anticipated Cessation Date _____
Attach Additional Sheets If Necessary.

CERTIFICATION

I, the undersigned, certify that I am authorized to execute this certification on behalf of the Bidder, that the foregoing information and any attachments hereto, to the best of my knowledge are true and complete. I acknowledge that the State of New Jersey is relying on the information contained herein, and that the Bidder is under a continuing obligation from the date of this certification through the completion of any contract(s) with the State to notify the State in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification. If I do so, I will be subject to criminal prosecution under the law, and it will constitutea material breach of my agreement(s) with the State, permitting the State to declare any contract(s) resulting from this certification void and unenforceable.

_____ _____
Signature Date

_____
Print Name and Title

PROJECT LABOR AGREEMENT

COVERING INTERIOR RENOVATION, CONSTRUCTION AND UPGRADES, 135 W. HANOVER STREET, TRENTON, MERCER COUNTY

ARTICLE 1-PREAMBLE

WHEREAS, The State of New Jersey, Department of the Treasury, Division of Property Management and Construction (DPMC) (the "Owner"), desires to provide for the efficient, safe, quality, and timely completion of construction of the "Interior Renovation, Construction and Upgrades at 135 W. Hanover Street, Trenton, Mercer County" (the "Project") in a manner designed to afford lower costs to the Owner and the public it represents, and the advancement of public policy objectives; and

WHEREAS, this Project Labor Agreement will foster the achievement of these goals, inter alia by:

(1) Ensuring a reliable source of skilled and experienced labor;

(2) Standardizing the terms and conditions governing the employment of labor on the Project;

(3) Permitting wide flexibility in work scheduling and shift hours and times from those which otherwise might obtain;

(4) Receiving negotiated adjustments as to work rules and staffing requirements from those which otherwise might obtain;

(5) Providing comprehensive and standardized mechanisms for the settlement of work disputes, including those relating to jurisdiction;

(6) Avoiding the costly delays of potential strikes, slowdowns, walkouts, picketing and other disruptions arising from work disputes and promote labor harmony and peace for the duration of the Projects;

(7) Furthering public policy objectives as to improved employment opportunities for minorities, women and the economically disadvantaged in the construction industry; and

(8) Expediting the construction process;

SAMPLE

WHEREAS, the signatory Unions desire the stability, security and work opportunities afforded by a Project Labor Agreement;

WHEREAS, the Parties desire to maximize Project safety conditions for both workers and public,

NOW, THEREFORE, the Parties enter into this Agreement:

SECTION 1: PARTIES TO THE AGREEMENT

This is a Project Labor Agreement ("Agreement") entered into by and between DPMC (the "Owner") and its successors and assigns, for certain construction work to be performed on the "Interior Renovation, Construction and Upgrades, 135 W. Hanover Street, Trenton, Mercer County" (the "Project") and by the Mercer County and Vicinity Building and Construction Trades Council, ("the County Council"), on behalf of itself and its affiliated local union members, and the signatory Local Unions on behalf of themselves and their members.

ARTICLE 2 – GENERAL CONDITIONS

SECTION 1: DEFINITIONS

Throughout this Agreement, the Union parties and the signatory Local Unions and County Council are referred to singularly and collectively as "Union(s)." Where specific reference is made to "Local Unions," that phrase is sometimes used. The term "Contractor(s)" shall include all signatory contractors, and their subcontractors of whatever tier, engaged in on-site Project construction work within the scope of this Agreement as defined in Article 3; DPMC is referenced as "Owner"; the Mercer County and Vicinity Building and Construction Trades Council is referenced as the "County

SAMPLE

Council"; and the work covered by this Agreement (as defined in Article 3) is referred to as the "Project."

SECTION 2: CONDITIONS FOR AGREEMENT TO BECOME EFFECTIVE

The Agreement shall not become effective unless executed by the County Council and the Owner and will remain in effect until the completion of the Project.

SECTION 3: ENTITIES BOUND & ADMINISTRATION OF AGREEMENT

This Agreement shall be binding on all signatory Unions and the Owner and all signatory Contractors performing on-site Project work, including site preparation and staging area, as defined in Article 3. The Contractors shall include in any subcontract that they let for performance during the term of this Agreement, a requirement that their subcontractors, of whatever tier, become signatory and bound by this Agreement with respect to subcontracted work performance within the scope of Article 3 and execute the Letter of Assent attached as Schedule B. This Agreement shall be administered by the Owner, on behalf of all Contractors.

SECTION 4: SUPREMACY CLAUSE

This Agreement, together with the local Collective Bargaining Agreements appended hereto as Schedule A, represents the complete understanding of all signatories and supersedes any national agreement, local agreement or other collective bargaining agreement of any type which would otherwise apply to this Project, in whole or in part except for all work performed under the NTD National Articles of Agreement, the National Stack/Chimney Agreement, the National Cooling Tower Agreement, all instrument calibration work and loop checking shall be performed under the terms of the UA/IBEW Joint National Agreement for Instrument and Control Systems Technicians and the National Agreement of the International Union of Elevator Constructors, with the

SAMPLE

exception of Article VII, IX, and X of this Project Agreement, which shall apply to such work. Where a subject covered by the provisions, explicit or implicit, of this Agreement is also covered by a Schedule A, the provisions of this Agreement shall prevail. It is further understood that neither the Owner nor any Contractor shall be required to sign any other agreement as a condition of performing work on this Project. No practice, understanding or agreement between a Contractor and a Local Union which is not explicitly set forth in this Agreement shall be binding on this Project unless endorsed in writing by the Owner.

SECTION 5: LIABILITY

The liability of any Contractor and the liability of any Union under this Agreement shall be several and not joint. The Owner and any Contractor shall not be liable for any violations of this Agreement by any other Contractor; and the County Council and Local Unions shall not be liable for any violations of this Agreement by another Union.

SECTION 6: THE OWNER

The Owner shall require in its bid specifications for all work within the scope of Article 3 that all successful bidders, and their subcontractors of whatever tier, become bound by, and signatory to, this Agreement. The Owner is not a party to and shall not be liable in any manner under this Agreement. It is understood that nothing in this Agreement shall be construed as limiting the sole discretion of the Owner in determining which Contractors shall be awarded contracts for Project work. It is further understood that the Owner has sole discretion at any time to terminate, delay or suspend the work, in whole or part, on this Project.

SAMPLE

SECTION 7: AVAILABILITY AND APPLICABILITY TO ALL SUCCESSFUL BIDDERS

The Unions agree that this Agreement will be made available to, and will fully apply to any successful bidder to Project work who becomes signatory thereto, without regard to whether that successful bidder performs work at other sites on either a union or non- union basis and without regard to whether employees of such successful bidder are, or are not, members of any unions. This Agreement shall not apply to the work of any Contractor which is performed at any location other than the Project site, as defined in Article 3, Section 1.

ARTICLE 3 – SCOPE OF THE AGREEMENT

The Project work covered by this Agreement shall be as defined and limited by the following sections of this Article.

SECTION 1: THE WORK

This Agreement shall only apply to the on-site construction work, including site preparation, demolition and hazardous waste remediation, performed on the project defined as the "Interior Renovation, Construction and Upgrades, 135 W. Hanover Street, Trenton, Mercer County" (the "Project") during the time period of this Agreement as set forth in the bid documents covering Construction Contract A1349-00.

The scope of work is confined to the on-site Project work contained in the scope of the Owner's final construction contract.

SECTION 2: EXCLUDED EMPLOYEES

The following persons are not subject to the provisions of this Agreement, even though performing work on the Project:

SAMPLE

a. Superintendents, supervisors (excluding general and forepersons specifically covered by a craft's Schedule A), engineers, inspectors and testers (excluding divers specifically covered by a craft's Schedule A), quality control/assurance personnel, timekeepers, mail carriers, clerks, office workers, messengers, guards, non-manual employees, and all professional, engineering, administrative and management persons;

b. Employees of the Owner or any other state agency, authority or entity or employees of any municipality or other public employer;

c. Employees and entities engaged in off-site manufacture, modifications, repair, maintenance, assembly, painting, handling or fabrication of project components, materials, equipment or machinery. However, employees and entities involved in off-site operations who are covered by the Prevailing Wage Act (for example, by being dedicated exclusively to the performance of the public work contract or building project and are adjacent to the site of work), or are involved in deliveries to and from the project site (except for local deliveries of all major construction materials including fill, ready mix concrete and cement, asphalt, and other items), shall be subject to this Agreement. Provided, however, local deliveries of ready mix, concrete, cement and asphalt shall not be contracted except to a subcontractor who pays wages and benefits not less than the economic equivalent of the wages and benefits set forth in Exhibit A.

d. Employees of the Contractor, excepting those performing manual, on-site construction labor who will be covered by this Agreement;

e. Employees engaged in on-site equipment warranty work;

f. Employees engaged in geophysical testing (whether land or water) other than boring for core samples;

g. Employees engaged in laboratory or specialty testing or inspections;

h. Employees engaged in ancillary Project work performed by third parties such as electric utilities, gas utilities, telephone companies and railroads.

SECTION 3. NON-APPLICATION TO CERTAIN ENTITIES

This Agreement shall not apply to the parents, affiliates, subsidiaries, or other joint or sole ventures of any Contractors that do not perform work at this Project. It is agreed, for the purposes of this Agreement only, that this Agreement does not have the effect of creating any joint employment, single employer or alter ego status among the Owner and/or any Contractor. The Agreement shall further not apply to the Owner or

SAMPLE

any other state or county agency, authority, or other municipal or public entity and nothing contained herein shall be construed to prohibit or restrict the Owner or its employees or any other state authority, agency or entity and its employees from performing on or off-site work related to the Project. As the contracts which comprise the Project work are completed and accepted, the Agreement shall not have further force or effect on such items or areas except where inspections, additions, repairs, modifications, check-out and/or warranty work are assigned in writing (copy to Local Union involved) by the Owner or Contractor for performance under the terms of this Agreement.

ARTICLE 4 – UNION RECOGNITION AND EMPLOYMENT

SECTION 1. PRE-HIRE RECOGNITION

The Contractors recognize the signatory Unions as the sole and exclusive bargaining representatives of all craft employees who are performing on-site Project work within the scope of this Agreement as defined in Article 3.

SECTION 2. UNION REFERRAL

A. The Contractors agree to hire craft employees covered by this Agreement through the job referral systems and hiring halls (where the referrals meet the qualifications set forth in items 1, 2 and 4 of subparagraph B) established in the Local Unions' area collective bargaining agreements (attached as Schedule A to this Agreement). Notwithstanding this, the Contractors shall have sole rights to determine the competency of all referrals; the number of employees required (except with regard to pile driving and cranes); the selection of employees to be laid-off (except as

SAMPLE

provided in Article 5, Section 3); and the sole right to reject any applicant referred by a Local Union, subject to the show-up payments required in the applicable Schedule A. In the event that a Local Union is unable to fill any request for qualified employees within a 48-hour period after such requisition is made by the Contractor (Saturdays, Sundays and holidays excepted), the Contractor may employ qualified applicants from any other available source. In the event that the Local Union does not have a job referral system, the Contractor shall give the Local Union first preference to refer applicants, subject to the other provisions of this Article. The Contractor shall notify the Local Union of craft employees hired within its jurisdiction from any source other than referral by the Union.

B. Following the employment of the first employee in each craft under Schedule A or the procedure set forth above in paragraph A, a Contractor may request by name, and the Local will honor, referral of persons who have applied to the Local for Project work and who meet the following qualifications as determined by a Committee of 3 designated, respectively, the applicable Local Union, the Owner, a mutually selected third party or, in the absence of agreement, the permanent arbitrator (or designee) designated in Article 7:

(1) possess any license required by New Jersey law for the Project work to be performed;

(2) have worked a total of at least 1000 hours in the Construction craft during the prior three years;

(3) were on the Contractor's active payroll for at least 60 out of the 180 calendar days prior to the contract award; and

SAMPLE

(4) have demonstrated ability to safely perform the basic functions of the applicable trade.

Following the employment of the first employee in each craft under Schedule A, no more than 12 per centum of the employees covered by this Agreement, per Contractor by craft, shall be hired through the special provisions above (any fraction shall be rounded to the next highest whole number).

SECTION 3. NON-DISCRIMINATION IN REFERRALS

The Unions represent that their hiring halls and referral systems will be operated in a non-discriminatory manner and in full compliance with all applicable federal, state and local laws and regulations which require equal employment opportunities. Referrals shall not be affected in any way by the rules, regulations, bylaws, constitutional provisions or any other aspects or obligations of union membership, policies or requirements and shall be subject to such other conditions as are established in this Article. No employment applicant shall be discriminated against by any referral system or hiring hall because of the applicant's union membership, or lack thereof.

SECTION 4. MINORITY AND FEMALE REFERRALS

In the event a Union either fails, or is unable, to refer qualified minority or female applicants in percentages equaling Project affirmative action goals as set forth in the Owner's bid specifications, the Contractor may employ qualified minority or female applicants from any other available source as Apprentice Equivalents. Apprentice Equivalents will have completed a Department of Labor (DOL) approved training program, applied to take a construction Apprenticeship test, and will be paid at not less then the applicable equivalent Apprentice rate. With the approval of the Local

SAMPLE

Administrative Committee (LAC), experience in construction related areas may be accepted as meeting the above requirements.

SECTION 5. CROSS AND QUALFIED REFERRALS

The Unions shall not knowingly refer to a Contractor an employee then employed by another Contractor working under this Agreement. The Local Unions will exert their utmost efforts to recruit sufficient numbers of skilled and qualified crafts employees to fulfill the requirements of the Contractor.

SECTION 6. UNION DUES / WORKING ASSESSMENTS

The union security provisions contained in the applicable Schedule A local agreements, shall not apply to the employees covered by this Agreement as for the period of time during which they are performing on-site Project work. No employee shall be discriminated against at the Project site because of the employee's union membership or lack thereof. In the case of unaffiliated employees who have voluntarily executed dues checkoff authorization cards provided in a Schedule A local agreement, the dues payment can be received by the Unions as a working assessment fee.

SECTION 7. CRAFT FOREPERSONS AND GENERAL FOREPERSONS

The selection of craft forepersons and/or general forepersons and the number of forepersons required shall be solely the responsibility of the Contractor except where otherwise provided by specific provisions of an applicable Schedule A. All forepersons shall take orders exclusively from the designated Contractor representatives. Craft forepersons shall be designated as working forepersons at the request of the Contractor, except when an existing local Collective Bargaining Agreement prohibits a foreperson from working when the craftpersons he is leading exceed a specified number.

SAMPLE

ARTICLE 5 – UNION REPRESENTATION

SECTION 1. LOCAL UNION REPRESENTATIVE

Each Local Union representing on-site Project employees shall be entitled to designate in writing (copy to Contractor and Owner) one representative, including the Business Manager, who shall be afforded access to the Project.

SECTION 2. STEWARDS

(a) Each Local Union shall have the right to designate a working journeyperson as a Steward and an alternate, and shall notify the Contractor and Owner of the identity of the designated Steward (and alternate) prior to the assumption of such duties. Stewards shall not exercise supervisory functions and will receive the regular rate of pay for their craft classifications. There will be no non-working Stewards on the Project.

(b) In addition to his or her work as an employee, the Steward shall have the right to receive complaints or grievances and to discuss and assist in their adjustment with the Contractor's appropriate supervisor. Each Steward shall be concerned with the employees of the Steward's Contractor and, if applicable, subcontractors of that Contractor, but not with the employees of any other Contractor. The Contractor will not discriminate against the Steward in the proper performance of Union duties.

(c) The Stewards shall not have the right to determine when overtime shall be worked, or who shall work overtime except pursuant to a Schedule A provision providing procedures for the equitable distribution of overtime.

SAMPLE

SECTION 3. LAYOFF OF A STEWARD

Contractors agree to notify the appropriate Union 24 hours prior to the layoff of a Steward, except in cases of discipline or discharge for just cause. If a Steward is protected against layoff by a Schedule A, such provisions shall be recognized to the extent the Steward possesses the necessary qualifications to perform the work required. In any case in which a Steward is discharged or disciplined for just cause, the Local Union involved shall be notified immediately by the Contractor.

ARTICLE 6 – MANAGEMENT'S RIGHTS

SECTION 1. RESERVATION OF RIGHTS

Except as expressly limited by a specific provision of this Agreement, Contractors retain full and exclusive authority for the management of their Project operations including, but not limited to: the right to direct the work force, including determination as to the number to be hired and the qualifications thereof; the promotion, transfer, layoff of its employees; or the discipline or discharge for just cause of its employees; the assignment and schedule of work; the promulgation of reasonable Project work rules; and the requirement, timing and number of employees to be utilized for overtime work. No rules, customs, or practices which limit or restrict productivity or efficiency of the individual, as determined by the Contractor or Owner, and/or joint working efforts with other employees shall be permitted or observed.

SECTION 2. MATERIALS, METHODS & EQUIPMENT

There shall be no limitations or restriction upon the Contractor's choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-

SAMPLE

fabricated, pre-finished, or pre-assembled materials, tool, or other labor-saving devices. Contractors may, without restriction, install or use materials, supplies or equipment regardless of their source. The on-site installation or application of such items shall be performed by the craft having jurisdiction over such work; provided, however, it is recognized that other personnel having special qualifications may participate, in a supervisory capacity, in the installation, check-out or testing of specialized or unusual equipment or facilities as designated by the Contractor. Notwithstanding the foregoing statement of Contractor rights, prefabrication issues relating to work traditionally performed at the job site shall be governed pursuant to the terms of the applicable Schedule A. There shall be no restrictions as to work, which is performed off-site for the Project, except for 1) offsite operations work covered under the New Jersey Prevailing Wage Act or 2) work done in a fabrication center, tool yard, or batch plant dedicated exclusively to the performance of work on the Project, and located adjacent to the "site of work".

ARTICLE 7 – WORK STOPPAGES AND LOCKOUTS

SECTION 1. NO STRIKES – NO LOCKOUTS

There shall be no strikes, sympathy strikes, picketing, work stoppages, slowdowns, hand billing, demonstrations or other disruptive activity at the Project for any reason by any Union or employee against any Contractor or employer while performing work at the Project. There shall be no other Union, or concerted or employee activity which disrupts or interferes with the free flow of traffic in the Project area. Failure of any Union or employee to cross any picket line established by any Union, signatory or non-signatory to this Agreement, or the picket or demonstration line of any other

SAMPLE

organization, at or in proximity to the Project site is a violation of this Article. There shall be no lockout at the Project by any signatory Contractor. Contractors and Unions shall take all steps necessary to ensure compliance with this Section 1 and to ensure uninterrupted construction and the free flow of traffic in the Project area for the duration of this Agreement.

SECTION 2. DISCHARGE FOR VIOLATION

A Contractor may discharge any employee violating Section 1, above, and any such employee will not be eligible thereafter for referral under this Agreement for a period of 100 days.

SECTION 3. NOTIFICATION

If a Contractor contends that any Union has violated this Article, it will notify the appropriate district or area council of the Local Union involved advising of such fact, with copies of the notification to the Local Union and the County Council. The district or area council and the County Council shall each instruct, order and otherwise use their best efforts to cause the employees, and/or the Local Unions to immediately cease and desist from any violation of this Article. A district or area council, and/or the County Council complying with these obligations shall not be liable for the unauthorized acts of a Local Union or its members.

SECTION 4. EXPEDITED ARBITRATION

Any Contractor or Union alleging a violation of Section 1 of this Article may utilize the expedited procedure set forth below (in lieu, of, or in addition to, any actions at law or equity) that may be brought.

a. A party invoking this procedure shall notify J.J. Pierson, Jr., Esq., at 51 JFK Parkway, First Floor West, Short Hills, New Jersey 07078, telephone

SAMPLE

number (973) 359-8161, who shall serve as Arbitrator under this expedited arbitration procedure. In the event that J.J. Pierson is unable to serve, a party invoking this procedure shall notify Gary Kendellen, who shall serve as Arbitrator under this expedited procedure. Copies of such notification will be simultaneously sent to the alleged violator and, if a Local Union is alleged to be in violation, it's International, the Owner, the County Council, and the Contractor.

b. The Arbitrator shall thereupon, after notice as to time and place to the Contractor, the Local Union involved, the County Council and the Owner, hold a hearing within 48 hours of receipt of the notice invoking the procedure if it is contended that the violation still exists. The hearing will not, however, be scheduled for less than 24 hours after the notice to the district or area council required by Section 3, above. Hearings shall be held at the jobsite or at the Newark office of the New Jersey State Board of Mediation, as directed by the Arbitrator.

c. All notices pursuant to this Article may be by telephone, email, telegraph, hand delivery, or fax, confirmed by overnight delivery, to the arbitrator, Contractor or Union involved. The hearing may be held on any day including Saturdays or Sundays. The hearing shall be completed in one session which shall not exceed eight hours duration (no more than four hours being allowed to either side to present their case, and conduct their cross-examination) unless otherwise agreed. A failure of any Union or Contractor to attend the hearing shall not delay the hearing of evidence by those present or the issuance of an award by the Arbitrator.

SAMPLE

d. The sole issue at the hearing shall be whether a violation of Section 1, above, occurred. If a violation is found to have occurred, the Arbitrator shall issue a Cease and Desist Award restraining such violation and serve copies on the Contractor and Union involved. The Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages, which issue is reserved solely for court proceedings, if any. The Award shall be issued in writing within three hours after the close of the hearing, and may be issued without an opinion. If any involved party desires an opinion one shall be issued within 15 calendar days, but its issuance shall not delay compliance with, or enforcement of, the Award.

e. An award issued under this procedure may be enforced by any court of competent jurisdiction upon the filing of this Agreement together with the Award. Notice of the filing of such enforcement proceedings shall be given to the Union or Contractor involved. In any court proceeding to obtain a temporary or preliminary order enforcing the arbitrator's Award as issued under this expedited procedure, the involved Union and Contractor waive their right to a hearing and agree that such proceedings may be ex parte, provided notice is given to opposing counsel. Such agreement does not waive any party's right to participate in a hearing for a final court order of enforcement or in any contempt proceeding.

f. Any rights created by statute or law governing arbitration proceedings which are inconsistent with the procedure set forth in this Article, or

SAMPLE

which interfere with compliance thereto, are hereby waived by the Contractors and Unions to whom they accrue.

g. The fees and expenses of the Arbitrator shall be equally divided between the involved Contractor and Union.

SECTION 5. ARBITRATION OF DISCHARGES FOR VIOLATION

Procedures contained in Article 9 shall not be applicable to any alleged violation of this Article, with the single exception that an employee discharged for violation of Section 1, above, may have recourse to the procedures of Article 9 to determine only if the employee did, in fact, violate the provisions of Section 1 of this Article; but not for the purpose of modifying the discipline imposed where a violation is found to have occurred.

ARTICLE 8 – LOCAL ADMINISTRATIVE COMMITTEE (LAC)

SECTION 1. MEETINGS

The Local Administrative Committee (LAC) will meet on a regular basis to 1) Implement and oversee the Agreement procedures and initiatives; 2) monitor the effectiveness of the Agreement; and 3) identify opportunities to improve efficiency and work execution.

SECTION 2. COMPOSITION

The LAC will be co-chaired by designees of the President of the County Council or his designee and the designated official of the Owner. It will be comprised of representatives of the Local Union's signatory to this Agreement (PLA), and representatives of the Owner and Contractors on this project.

SAMPLE

ARTICLE 9 – GRIEVANCE & ARBIRTRATION PROCEDURE

SECTION 1. PROCEDURE FOR RESOLUTION OF GRIEVANCES

Any question, dispute or claim arising out of, or involving the interpretation of application of this Agreement (other than jurisdictional disputes or alleged violations of Article 7, Section 1) shall be considered a grievance and shall be resolved pursuant to the exclusive procedure of the steps described below; provided, in all cases, that the question, dispute or claim arose during the term of this Agreement.

STEP 1:

(a) When any employee covered by this Agreement feels aggrieved by a claimed violation of this Agreement, the employee shall, through the Local Union business representative or job steward, give notice of the claimed violation to the work site representative of the involved Contractor. To be timely, such notice of the grievance must be within 7 business days after the act, occurrence, or event, giving rise to the grievance or after the act, occurrence or event became known or should have become known to the Union. The business representative of the Local Union or the job steward and site representative of the involved Contractor shall meet and endeavor to adjust the matter within 3 business days after timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving party, may, within 7 calendar days thereafter, pursue Step 2 of the grievance procedure by serving the involved Contractor and the Owner with written copies of the grievance setting forth a description of the claimed violation, the date of which the grievance occurred, and the provisions of the

SAMPLE

Agreement alleged to have been violated. Grievances and disputes settled at Step 1 are non-precedential except as to the specific Local Union, employee and Contractor directly involved unless the settlement is accepted in writing by the Contractor as creating a precedent.

(b) Should any signatory to this Agreement have a dispute (excepting jurisdictional disputes or alleged violations of Article 7, Section 1) with any other signatory to this Agreement and, if after conferring, a settlement is not reached within 9 business days, the dispute shall be reduced to writing and proceed to Step 2 in the same manner as outlined in subparagraph (a) for the adjustment of employee grievances.

STEP 2:

The Business Manager or designee of the involved Local Union, together with representatives of the County Council, the involved Contractor, and the Contractor shall meet in Step 2 within 5 calendar days of the written grievance to arrive at a satisfactory settlement.

STEP 3:

(a) If the grievance shall have been submitted but not resolved in Step 2, any of the participating Step 2 entities may within fourteen (14) calendar days after the initial Step 2 meeting, submit the grievance in writing (copies to other participants) to the next available arbitrator of the panel of arbitrators consisting of J.J. Pierson Jr., Esq., Gary Kendellen and Wellington Davis, who shall act as the Arbitrator under this expedited procedure. The Labor Arbitration Rules of the American Arbitration Association shall govern the conduct of the arbitration hearing, at which all Step 2 participants shall be parties. Hearings shall be held at

SAMPLE

the jobsite or at the Newark office of the New Jersey State Board of Mediation, as directed by the Arbitrator. The decision of the Arbitrator shall be final and binding on the involved Contractor, Local Union and employees and the fees and expenses of such arbitrations shall be borne equally by the involved Contractor and Local Union.

(b) Failure of the grieving party to adhere to the time limits set forth in this Article shall render the grievance null and void. These time limits may be extended only by written consent of the involved Contractor and involved Local Union at the particular step where the extension is agreed upon. The Arbitrator shall have authority to make decisions only on the issues presented to him and shall not have the authority to change, add to, delete or modify any provision of this Agreement.

SECTION 2. LIMITATION AS TO RETROACTIVITY

No arbitration decision or award may provide retroactivity of any kind exceeding 30 calendar days prior to the date of service of the written grievance on the Owner and the involved Contractor or Local union.

SECTION 3. PARTICIPATION BY OWNER

The Owner and the President of the County Council shall be notified by the involved Contractor of all actions at Steps 2 and 3 and, at its election, the Owner may participate in full in all proceedings at these Steps, including Step 3 arbitration.

SAMPLE

ARTICLE 10 – JURISDICTIONAL DISPUTES

SECTION 1. NO DISRUPTIONS

There will be no strikes, sympathy strikes, work stoppages, slowdowns, picketing or other disruptive activity of any kind arising out of any jurisdictional dispute. Pending the resolution of the dispute, the work shall continue uninterrupted and as assigned by the Contractor. No jurisdictional dispute shall excuse a violation of Article 7.

SECTION 2. ASSIGNMENT

A. There shall be a mandatory pre-job markup / assignment meeting prior to the commencement of any work. Attending such meeting shall be designated representatives of the Union signatories to this Agreement, the Owner, Contractor, and the involved Contractors. Best efforts will be made to schedule the pre-job meeting in a timely manner after the Notice to Proceed is issued but not later then 30 days prior to the start of the Project.

B. All Project construction work assignments shall be made by the Contractor according to the criteria set forth in Section 3, Subsection D 1-3.

C. When a Contractor has made an assignment of work, he shall continue the assignment without alteration unless otherwise directed by an arbitrator or there is agreement between the National or International Unions involved. Claims of a change of original assignment shall be processed in accordance with Article I of the Procedural Rules of the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry (the "Plan").

D. In the event that a Union involved in the change of original assignment dispute is an affiliate of a National or International Union that is not affiliated with the Building

SAMPLE

and Construction Trades Council AFL-CIO and does not wish to process a case through the Plan, the parties shall mutually select one of the following Arbitrators: Arbitrator J.J. Pierson, Arbitrator Richard Greenburg or Arbitrator Richard K. Hanft and submit the dispute directly to the Arbitrator. The selected Arbitrator shall determine whether the case requires a hearing or may be decided upon written submissions. In rendering his determination on whether there has been a change of original assignment, the Arbitrator shall be governed by the following:

1. The contractor who has the responsibility for the performance and installation shall make a specific assignment of the work which is included in his contract to a particular union(s). For instance, if contractor A subcontracts certain work to contractor B, then contractor B shall have the responsibility for making the specific assignments for the work included in his contract. If contractor B, in turn, shall subcontract certain work to contractor C, then contractor C shall have the responsibility for making the specific assignment for the work included in his contract. After work has been so assigned, such assignment will be maintained even though the assigning contractor is replaced and such work is subcontracted to another contractor. It is a violation of the Agreement for the Contractor to hold up disputed work or shut down a project because of a jurisdictional dispute.

2. When a contractor has made an assignment of work, he shall continue the assignment without alteration unless otherwise directed by an arbitrator or there is agreement between the National and International Unions involved.

a. Unloading and/or handling of materials to stockpile or storage by a trade for the convenience of the responsible contractor when his employees are not on the

SAMPLE

job site, or in an emergency situation, shall not be considered to be an original assignment to that trade.

b. Starting of work by a trade without a specific assignment by an authorized representative of the responsible contractor shall not be considered an original assignment to that trade, provided that the responsible contractor, or his authorized representative, promptly, and, in any event, with eight working hours following the start of work, takes positive steps to stop further unauthorized performance of the work by that trade.

SECTION 3. PROCEDURE FOR SETTLEMENT OF DISPUTES

A. Any Union having a jurisdictional dispute with respect to Project work assigned to another Union will submit through its International the dispute in writing to the Administrator, Plan for the Settlement of Jurisdictional Disputes in the Construction Industry (the "Plan") within 72 hours and send a copy of the letter to the other Union involved, the Contractor involved, the Contractor, the County Council, and the district or area councils of the unions involved. Upon receipt of a dispute letter from any union, the Administrator will invoke the procedures set forth in the Plan to resolve the jurisdictional dispute. The jurisdictional dispute letter shall contain the information described in Article IV of the Procedural Rules of the Plan.

B. Within five calendar days of receipt of the dispute letter, there shall be a meeting of the Contractor, any other Contractor(s) or subcontractors involved, the Local Unions involved and designees of the County Council and the district or area councils of the Local Unions involved for the purpose of resolving the jurisdictional dispute.

C. In order to expedite the resolution of jurisdictional disputes, the parties have agreed in advance to mutually select one of the following designated Arbitrators:

SAMPLE

Arbitrator J.J. Pierson, Arbitrator Richard Greenburg or Arbitrator Richard K. Hanft to hear all unresolved jurisdictional disputes arising under this Agreement. All other rules and procedures of the Plan shall be followed. If none of the three Arbitrators is available to hear the dispute within the time limits of the Plan, the Plan's arbitrator selection process shall be utilized to select another arbitrator.

D. In the event that a Union involved in the dispute is an affiliate of a National or International Union that is not affiliated with the Building and Construction Trades Council AFL-CIO and does not wish to process a case through the Plan as described in paragraphs A-C above, the parties to the dispute shall mutually select one of the following Arbitrators: Arbitrator J.J. Pierson, Arbitrator Richard Greenburgor Arbitrator Richard K. Hanft to hear the dispute and shall submit the dispute directly to the selected Arbitrator. The time limits for submission and processing disputes shall be the same as provided elsewhere in this Section. The selected Arbitrator shall schedule the hearing within seven business days from the date of submission. If he cannot hear the case within the required timeframe, one of the other Arbitrators will be selected to hear the case unless all parties to the dispute agree to waive the seven day time limit. In rendering his decision, the Arbitrator shall determine:

1. First whether a previous agreement of record or applicable agreement, including a disclaimer agreement, between the National and International Unions to the dispute governs;

2. Only if the Arbitrator finds that the dispute is not covered by an appropriate or applicable agreement of record or agreement between the crafts to the dispute, he shall then consider the established trade practice in the industry and prevailing practice in the locality. Where there is a previous decision of record

SAMPLE

governing the case, the Arbitrator shall give equal weight to such decision of record governing the case, unless the prevailing practice in the locality in the past ten years favors one craft. In that case, the Arbitrator shall base his decision on the practice in the locality. Except, that if the Arbitrator finds that a craft has improperly obtained the prevailing practice in the locality through raiding, the undercutting of wages or by the use of vertical agreements, the Arbitrator shall rely on the decision of record and established trade practice in the industry rather than the prevailing practice in the locality.

3. Only if none of the above criteria is found to exist, the Arbitrator shall then consider that because efficiency, cost or continuity and good management are essential to the well-being of the industry, the interests of the consumer or the practices of the employer shall not be ignored.

The Arbitrator shall set forth the basis for his decision and shall explain his findings regarding the applicability of the above criteria. If lower-ranked criteria are relied upon, the Arbitrator shall explain why the higher-ranked criteria were not deemed applicable. The Arbitrator's decision shall only apply to the job in dispute.

Each party to the arbitration shall bear its own expense for the arbitration and agrees that the fees and expenses of the Arbitrator shall be borne by the losing party or parties as determined by the Arbitrator.

E. The Arbitrator will render a short-form decision within five (5) days of the hearing based upon the evidence submitted at the hearing, with a written decision to follow within 30 days of the close of hearing.

F. This Jurisdictional Dispute Resolution Procedure will only apply to work performed by Local Unions on the Project.

SAMPLE

G. Any Local Union involved in a jurisdictional dispute on this Project shall continue working in accordance with Section 2 above and without disruption of any kind.

SECTION 4. AWARD

Any award rendered pursuant to this Article shall be final and binding on the disputing Local Unions and the involved Contractor on this Project only, and may be enforced in accordance with the provisions of Article VII of the Plan. Any award rendered pursuant to the alternate procedures of this Article shall be final and binding on the disputing Local Unions and the involved Contractor on this Project only, and may be enforced in any court of competent jurisdiction. Such award or resolution shall not establish a precedent on any other construction work not covered by this Agreement. In all disputes under this Article, the Contractor and the involved Contractors shall be considered parties in interest.

SECTION 5. LIMITATIONS

The Arbitrator shall have no authority to assign work to a double crew, that is, to more employees than the minimum required by the Contractor to perform the work involved; nor to assign the work to employees who are not qualified to perform the work involved; nor to assign work being performed by non-union employees to union employees. This does not prohibit the establishment, with the agreement of the involved Contractor, of composite crews where more than one employee is needed for the job. The aforesaid determinations shall decide only to whom the disputed work belongs.

SECTION 6. NO INTERFERENCE WITH WORK

A. There shall be no interference or interruption of any kind with the work of the Project while any jurisdictional dispute is being resolved. The work shall proceed as assigned by the Contractor until finally resolved under the applicable procedure of this

SAMPLE

Article. The award shall be confirmed in writing to the involved parties. There shall be no strike, work stoppage or interruption in protest of any such award. Any claims of a violation of this section shall be submitted and processed in accordance with the impediment to job progress provisions of the Plan.

B. In the event a Union alleged to have engaged in an impediment to job progress is an affiliate of a National or International Union that is not affiliated with the Building and Construction Trades Council AFL-CIO and does not wish to have the impediment to job progress charge processed through the Plan, the parties to the dispute shall mutually select one of the three Arbitrators designated in this Article to hear the dispute. The selected Arbitrator shall schedule the hearing within two business days from the date of submission. If he cannot hear the case within the required timeframe, one of the other Arbitrators shall be selected by the parties to hear the case unless all parties to the dispute agree to waive the two-day time limit. The sole issue at the hearing shall be whether or not a violation of this Section has in fact occurred, and the Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages. The Arbitrator's decision shall be issued in writing within 3 hours after the close of the hearing, and may be issued without an opinion. If any party desires an opinion, one shall be issued within 15 days, but its issuance shall not delay compliance with, or enforcement of, the decision. The Arbitrator may order cessation of the violation of this Section and other appropriate relief, and such decision shall be served on all parties by facsimile upon issuance. Each party to the arbitration shall bear its own expense for the arbitration and agrees that the fees and expenses of the Arbitrator shall be borne by the losing party or parties as determined by the Arbitrator.

ARTICLE 11 – WAGES AND BENEFITS

SECTION 1. CLASSIFICATION AND BASE HOURLY RATE

All employees covered by this Agreement shall be classified in accordance with the work performed and paid the base hourly wage rates for those classifications as specified in the attached Schedules A, as amended during this Agreement. Recognizing,

SAMPLE

however, that special conditions may exist or occur on the Project, the parties, by mutual agreement may establish rates and/or hours for one or more classifications which may differ from Schedule A. Parties to such agreements shall be the Owner, Contractor, the contractor/subcontractor involved, the involved Local Unions and the County Council.

SECTION 2. EMPLOYEE BENEFIT FUNDS

A. The Contractor agrees to pay contributions to the established funds in the amounts designated in Schedule A. Bona fide jointly trusteed fringe benefit plans established or negotiated through collective bargaining during the life of this Agreement may be added.

B. The Contractor agrees to be bound by the written terms of the legally established Trust Agreements specifying the detailed basis on which payments are to be paid into, and benefits paid out of, such Trust Funds but only with regard to work done on this Project and only for those employees to whom this Agreement requires such benefits Payments.

C. Should any contractor or subcontractor become delinquent in the payment of contributions to the fringe benefit funds, then the subcontractor at the next higher tier, or upon notice of the delinquency claim from the Union or the Trust Funds, agrees to withhold from the subcontractor such disputed amount from the next advance, or installment payment for work performed and the amount claimed and owed will be paid within thirty (30) days after receipt of the notification by the General Contractor, if not paid prior to said date by the delinquent contractor/subcontractor.

SAMPLE

ARTICLE 12 – HOURS OF WORK, PREMIUM PAYMENTS, SHIFTS AND HOLIDAYS

SECTION 1. WORK WEEK AND WORK DAY

A. The standard work week shall consist of 40 hours of work at straight time rates per the following schedule:

(1) Five-Day Work Week: Monday – Friday; five days, eight hours plus ½ hour unpaid lunch period per day.

(2) Four-Day Work Week: Monday – Thursday; four days ten hours plus ½ hour unpaid lunch period per day.

B. The Day Shift shall commence between the hours of 6:00 a.m. and 9:00 a.m. and shall end between the hours of 2:30 p.m. and 5:30 p.m. Starting and quitting times shall occur at the employees' place of work as may be designated by the Contractor in accordance with area practice.

C. Notice – the Contractor shall provide not less than five days prior notice to the Local Union involved as to the work hour schedules to be worked or such lesser notice as may be mutually agreed upon.

SECTION 2. OVERTIME

Overtime pay for hours outside of the standard work week and work day, described in paragraph A above, shall be paid in accordance with the applicable Schedule A. There will be no restriction upon the Contractor's scheduling of overtime or the non-discriminatory designation of employees who shall be worked. There shall be no pyramiding of overtime pay under any circumstances. The Contractor shall have the right to schedule work so as to minimize overtime.

SAMPLE

SECTION 3. SHIFTS

A. Flexible Schedules – Scheduling of shift work shall remain flexible in order to meet Project schedules and existing Project conditions including the minimization of interference with traffic. It is not necessary to work a day shift in order to schedule a second shift. Shifts must be worked a minimum of five consecutive work days, must have prior approval of the Owner, and must be scheduled with not less than five work days notice to the Local Union.

B. Second Shift – The second shift (starting between 2 p.m. and 8 p.m.) shall consist of eight hours work (or ten hours of work) for and equal number of hours pay at the straight time rate plus 15% in lieu of overtime and exclusive of a ½ hour unpaid lunch period.

C. Flexible Starting Times – Shift starting times will be adjusted by the Contractor as necessary to fulfill Project requirements subject to the notice requirements of paragraph A.

D. It is agreed that when project circumstances require a deviation from the above shifts, the involved unions, contractors and the Owner shall adjust the starting times of the above shifts or establish shifts which meet the project requirements. It is agreed that neither party will unreasonably withhold their agreement.

SECTION 4. HOLIDAYS

A. Schedule - There shall be 8 recognized holidays on the Project:

New Years Day	Labor Day
Presidents Day	Veterans Day
Memorial Day	Thanksgiving Day
Fourth of July	Christmas Day

*Work shall be scheduled on Good Friday pursuant to the craft's Schedule A.

SAMPLE

All said holidays shall be observed on the dates designated by New Jersey State Law. In the absence of such designations, they shall be observed on the calendar date except those holidays which occur on Sunday shall be observed on the following Monday. Holidays falling on Saturday are to be observed on the preceding Friday.

B. Payment - Regular holiday pay, if any, and/or premium pay for work performed on such a recognized holiday shall be in accordance with the applicable Schedule A.

C. Exclusivity - No holidays other than those listed in Section 4-A above shall be recognized nor observed except in Presidential Election years when Election Day is a recognized holiday. Columbus Day and the Friday after Thanksgiving shall be observed as a holiday for Elevator Constructors Local 1 only.

SECTION 5. REPORTING PAY

A. Employees who report to the work location pursuant to regular schedule and who are not provided with work or whose work is terminated early by a Contractor, for whatever reason, shall receive minimum reporting pay in accordance with the applicable Schedule A.

B. When an employee who has completed his/her scheduled shift and left the Project site is "called out" to perform special work of a casual, incidental or irregular nature, the employee shall receive pay for actual hours worked with a minimum guarantee, as may be required by the applicable Schedule A.

C. When an employee leaves the job or work location of his/her own violation or is discharged for a cause or is not working as a result of the Contractor's invocation of Section 7 below, he/she shall be paid only for he actual time worked.

D. Except as specifically set forth in this Article, there shall be no premiums, bonuses, hazardous duty, high time or other special payments of any kind.

SAMPLE

E. There shall be no pay for time not actually worked except as specifically set forth in this Article or except where specifically provided in applicable Schedule A.

SECTION 6. PAYMENT OF WAGES

A. Payday- Payment shall be made by check, drawn on a New Jersey bank with branches located within commuting distance of the job site. Paychecks shall be issued by the Contractor at the job site by 10 a.m. on Thursdays. Not more than 3 day's wages shall be held back in any pay period. Paycheck stubs shall contain the name and business address of the Contractor, together with an itemization of deductions from gross wages.

B. Termination – Employees who are laid off or discharged for cause shall be paid in full for that which is due them at the time of termination. The Contractor shall also provide the employee with a written statement setting forth the date of layoff or discharge.

SECTION 7. EMERGENCY WORK SUSPENSION

The Contractor may, if considered necessary for the protection of life and/or safety of employees or others, suspend all or a portion of Project Work. In such instances, employees will be paid for actual time worked; provided, however, that when the Contractor requests that employees remain at the job site available for work, employees will be paid for "stand-by" time at their hourly rate of pay.

SECTION 8. INJURY/DISABILITY

An employee, who, after commencing work, suffers a work-related injury or disability while performing work duties, shall receive no less than eight hours wages for that day. Further, the employee shall be rehired at such time as able to return to duties

SAMPLE

provided there is still work available on the Project for which the employee is qualified and able to perform.

SECTION 9. TIME KEEPING

A Contractor may utilize brassing or other systems to check employees in and out. Each employee must check in and out. The Contractor will provide adequate facilities for checking in and out in an expeditious manner.

SECTION 10. MEAL PERIOD

The Contractor shall schedule an unpaid period of not more than ½ hour duration at the work location between the 3rd and 5th hour of the scheduled shift. A Contractor may, for efficiency of operations, establish a schedule that coordinates the meal periods of two or more crafts. If an employee is required to work through the meal period, the employee shall be compensated in a manner established in the applicable Schedule A.

SECTION 11. BREAK PERIODS

Local area practice will prevail for coffee breaks.

ARTICLE 13 - APPRENTICES

SECTION 1. RATIOS

Recognizing the need to maintain continuing supportive programs designed to develop adequate numbers of competent workers in the construction industry and to provide craft entry opportunities for minorities, women and economically disadvantaged non-minority males, the Contractor will employ apprentices in their respective crafts to perform such work as is within their capabilities and which is customarily performed by the craft in which they are indentured. The Contractor may utilize apprentices and such other appropriate classifications as are contained in the applicable Schedule A in a ratio

SAMPLE

not to exceed 25% of the work force by craft (without regard to whether a lesser ratio is set forth is Schedule A), unless the applicable Schedule A provide for a higher percentage. Apprentices and such other classifications as are appropriate shall be employed in a manner consistent with the provision of the appropriate Schedule A.

SECTION 2. DEPARTMENT OF LABOR

To assist the Contractors in attaining a maximum effort on this Project, the Unions agree to work in close cooperation with, and accept monitoring by, the New Jersey State and federal Departments of Labor to ensure minorities, women, or economically disadvantaged are afforded opportunities to participate in apprenticeship programs that result in the placement of apprentices on this Project. To further ensure that this Contractor effort is attained, up to 50% of the apprentices placed on this Project should be first year, minority, women or economically disadvantaged apprentices. The Local Unions will cooperate with Contractor requests for minority, women or economically disadvantaged referrals to meet this Contractor effort.

ARTICLE 14 – SAFETY PROTECTION OF PERSON AND PROPERTY

SECTION 1. SAFETY REQUIREMENTS

The Contractor will ensure that applicable OSHA requirements and other requirements set forth in the contract documents are at all times maintained on the Project and the employees and Unions agree to cooperate fully with these efforts. Employees must perform their work at all times in a safe manner and protect themselves and the property of the Contractor and the Owner from injury or harm. Failure to do so will be grounds for discipline, including discharge.

SAMPLE

SECTION 2. CONTRACTOR RULES

Employees covered by this Agreement shall at all times be bound by the reasonable safety, security, and visitor rules as established by the Contractor and the Owner for this Project. Such rules will be published and posted in conspicuous places throughout the Project.

SECTION 3. INSPECTIONS

The Contractor and Owner retain the right to inspect incoming shipments of equipment, apparatus, machinery and construction materials of every kind.

ARTICLE 15 – NO DISCRIMINATION

SECTION 1. COOPERATIVE EFFORTS

The Contractor and Unions agree that they will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin or age in any manner prohibited by law or regulation. It is recognized that special procedures may be established by the Contractor and Local Unions and the New Jersey State Department of Labor and Workforce Development for the training and employment of persons who have not previously qualified to be employed on construction projects of the type covered by this Agreement. The parties to this Agreement will assist in such programs and agree to use their best efforts to ensure that the goals for female and minority employment are met on this Project.

SECTION 2. LANGUAGE OF AGREEMENT

The use of the masculine or feminine gender in this Agreement shall be construed as including both genders.

SAMPLE

ARTICLE 16 – GENERAL TERMS

SECTION 1. PROJECT RULES

The Owner and Contractor shall establish such reasonable Project rules as are appropriate for the good order of the Project provided they do not violate the terms of this Agreement. These rules will be explained at the pre-job conference and posted at the Project site and may be amended thereafter as necessary. Failure of an employee to observe these rules and regulations shall be grounds for discipline, including discharge. The fact that no order was posted prohibiting a certain type of misconduct shall not be a defense to an employee disciplined or discharge for such misconduct when the action taken is for cause.

SECTION 2. TOOLS OF THE TRADE

The welding/cutting torch and chain fall are tools of the trade having jurisdiction over the work performed. Employees using these tools shall perform any of the work of the trade. There shall be no restrictions on the emergency use of any tools or equipment by any qualified employee or on the use of any tools or equipment for the performance of work within the employee's jurisdiction.

SECTION 3. SUPERVISION

Employees shall work under the supervision of the craft foreperson or general foreperson.

SECTION 4. TRAVEL ALLOWANCES

There shall be no payments for travel expenses, travel time, subsistence allowance or other such reimbursements or special pay except as expressly set forth in this Agreement.

SAMPLE

SECTION 5. FULL WORK DAY

Employees shall be at their staging area at the starting time established by the Contractor and shall be returned to their staging area by quitting time after performing their assigned functions under the supervision of the Contractor. The signatories reaffirm their policy of a fair day's work for a fair day's wage.

SECTION 6. COOPERATION

The Owner and the Unions will cooperate in seeking any NJ Department of Labor and Workforce Development approvals that may be required for implementation of any terms of this Agreement.

ARTICLE 17 – SAVINGS AND SEPARABILITY

SECTION 1. THIS AGREEMENT

In the event that the application of any provision of this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of law, the provision involved shall be rendered, temporarily or permanently, null and void but the remainder of the Agreement shall remain in full force and effect. In such event, the Agreement shall remain in effect for contracts already bid and awarded or in construction where the Contractor voluntarily accepts the Agreement. The parties to this Agreement will enter into negotiations for a substitute provision in conformity with the law and the intent of the parties for contracts to be let in the future.

SECTION 2. THE BID SPECIFICATIONS

In the event that the bid specifications, or other action, requiring that a successful bidder become signatory to this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of law, such requirement shall be

SAMPLE

rendered, temporarily or permanently, null and void but the Agreement shall remain in full force and effect to the extent allowed by law. In such event, the Agreement shall remain in effect for contracts already bid and awarded or in construction where the Contractor voluntarily accepts the Agreement. The parties will enter into negotiations as to modifications to the Agreement to reflect the court action taken and the intent of the parties for contracts to be let in the future.

SECTION 3. NON-LIABILITY

In the event of an occurrence referenced in Section 1 or Section 2 of this Article, neither the Owner, the Contractor, nor any signatory Union shall be liable, directly or indirectly, for any action taken, or not taken, to comply with any court order, injunction or determination. Project bid specifications will be issued in conformance with court orders then in effect and no retroactive payments or other action will be required if the original court determination is ultimately reversed.

SECTION 4. NON-WAIVER

Nothing in this Article shall be construed as waiving the prohibitions of Article 7 as to signatory Contractors and signatory Unions.

ARTICLE 18 – FUTURE CHANGES IN SCHEDULE A AREA CONTRACTS

SECTION 1. CHANGES TO AREA CONTRACTS

A. Schedule A to this Agreement shall continue in full force and effect until the Contractor and/or Union parties to the Area Collective Bargaining Agreements which are the basis for Schedule A notify the Contractor in writing of the mutually agreed upon changes in provision of such agreements which are applicable to the Project, and their effective dates.

SAMPLE

B. It is agreed that any provisions negotiated into Schedule A collective bargaining agreements will not apply to work on this Project if such provisions are less favorable to this Project than those uniformly required of contractors for construction work normally covered by those agreements; nor shall any provision be recognized or applied on this Project if it may be construed to apply exclusively, or predominantly, to work covered by this Project Agreement.

C. Any disagreement between signatories to this Agreement over the incorporation into Schedule "A" of provisions agreed upon in the renegotiation of Area Collective Bargaining Agreements shall be resolved in accordance with the procedure set forth in Article 9 of this Agreement.

SECTION 2. LABOR DISPUTES DURING AREA CONTRACT NEGOTIATIONS

The Unions agree that there will be no strikes, work stoppages, sympathy actions, picketing, slowdowns or other disruptive activity or other violations of Article 7 affecting the Project by any Local Union involved in the renegotiation of Area Local Collective Bargaining Agreements nor shall there be any lockout on this Project affecting a Local Union during the course of such renegotiations. The Contractor agrees that all payments due under any renegotiated area Local Collective Bargaining Agreement shall be made retroactive to the effective date thereof.

ARTICLE 19 – HELMETS TO HARDHATS

The Contractor and the Unions recognize a desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The Contractor and Unions agree to utilize the services of the Center for Military Recruitment, Assessment and Veterans Employment (hereinafter

SAMPLE

"Center") and the Center's "Helmets to Hardhats" program to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by the parties.

The Unions and Contractor agree to coordinate with the Center to create and maintain an integrated database of veterans interested in working on the Project and of apprenticeship and employment opportunities for the Project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed and effective as of the _____ day of _____, 2023.

FOR THE DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION

By: _____
Richard Flodmand, Deputy Director

FOR THE BUILDING AND CONSTRUCTION TRADES MERCER COUNTY AND VICINITY BUILDING AND CONSTRUCTION TRADES COUNCIL

By: _____
Wayne DeAngelo, President

FOR LOCAL UNION AFFILIATES:

ASBESTOS WORKERS, LOCAL

By: _____
(Name/Title)

SAMPLE

BRICKLAYERS AND ALLIED CRAFTS, LOCAL

By: _____
(Name/Title)

CARPENTERS, LOCAL

By: _____
(Name/Title)

CARPENTERS, LOCAL

By: _____
(Name/Title)

DOCKBUILDERS AND PILE DRIVERS, LOCAL

By: _____
(Name/Title)

INT. BROTHERHOOD OF ELECTRICAL WORKERS, LOCAL

By: _____
(Name/Title)

ELEVATOR CONSTRUCTORS, LOCAL

By: _____
(Name/Title)

IRONWORKERS, LOCAL

By: _____
(Name/Title)

LABORERS, LOCAL

By: _____
(Name/Title)

SAMPLE

HEAVY CONSTRUCTION LABORERS, LOCAL

By: _____
(Name/Title)

MILLWRIGHTS, LOCAL

By: _____
(Name/Title)

OPERATING ENGINEERS, LOCAL

By: _____
(Name/Title)

OPERATIVE PLASTERS & CEMENT MASONS, LOCAL

By: _____
(Name/Title)

PAINTERS AND ALLIED TRADES, LOCAL

By: _____
(Name/Title)

PIPEFITTERS, LOCAL

By: _____
(Name/Title)

PLUMBERS, LOCAL

By: _____
(Name/Title)

SAMPLE

ROOFERS AND WATERPROOFERS, LOCAL

By: _____
(Name/Title)

SHEETMETAL WORKERS, LOCAL

By: _____
(Name/Title)

SPRINKLEFITTERS, LOCAL

By: _____
(Name/Title

TEAMSTERS, LOCAL

By: _____
(Name/Title)

TILE/MARBLE/TERRAZZO WORKERS, LOCAL

By: _____
(Name/Title)

END

SAMPLE

SCHEDULE A

A COPY OF EACH UNION'S CURRENT COLLECTIVE BARGAINIG AGREEMENT IS INCLUDED AS PART OF SCHEDULE A BY REFERENCE, UPON EXECUTION BY THE SIGNATORY LOCAL.

Asbestos Workers, Local

Bricklayers and Allied Crafts, Locals

Carpenters, Locals

Dockbuilders and Pile Drivers, Local

Electrical Workers, Local

Elevator Constructors, Local

Ironworkers, Local

Laborers, Local

Heavy Construction Laborers, Local

Millwrights, Local

Operating Engineers, Local

Operative Plasters & Cement Masons, Local

Painters and Allied Trades, District Council

Pipefitter, Local

Plasterers & Cement Masons, Local

Plumbers , Local

Roofers and Waterproofers, Local

Sheet Metal Workers, Local

Sprinklerfitters, Local

Teamsters, Local

Tile/Marble/Terrazzo Workers, Local

SAMPLE

PROJECT LABOR AGREEMENT

COVERING INTERIOR RENOVATION, CONSTRUCTION AND UPGRADES,
135 W. HANOVER STREET, TRENTON, MERCER COUNTY
DPMC PROJECT A1349-00

TELE-DATA ADDENDUM

The parties hereby agree that all Tele-data work and associated electrical work performed on any of the sites during construction shall be done by employees represented by the signatory unions. For the purpose of this Agreement, Tele-data work shall include, but not limited to, the following: All receiving, placement, installation, operation, testing, inspection, maintenance, repair and service of radio, television, video, data, voice, sound, emergency call, microwave and visual production and reproduction apparatus, equipment and appliances used for domestic, commercial, education and entertainment purposes; all installation and erection of equipment, apparatus or appliance, cables and/or wire, emergency power (batteries) and all directly related work which becomes an integral part of the telecommunication and/or telecommunications related systems repair and service maintenance work of telecommunications systems and devices including, but not limited to, Private Branch Exchanges (PBX-PABX), Key equipment-owned, CCTV, CATV, card access, Systems RS 232 ethernet and/or any local area network system associated with computer installation.

SAMPLE

_____ **SIGNATORY UNIONS**

BY:_____ BY:_____

PROJECT LABOR AGREEMENT

COVERING INTERIOR RENOVATION, CONSTRUCTION AND UPGRADES,
135 W. HANOVER STREET, TRENTON, MERCER COUNTY
DPMC PROJECT A1349-00

SHEET METAL ADDENDUM

(General Contractor) (Project Management Firm) agrees that when subcontracting for prefabrication of H.V.A.C. duct and other related sheet metal, such prefabrication shall be subcontracted to fabricators who pay their employees engaged in such fabrication not less than the prevailing wage for comparable sheet metal fabrication as established under agreements between local affiliates of Sheet Metal Workers' International Association and local sheet metal fabricators.

(General Contractor) (Project Management Firm) and the Sheet Metal Workers' International Association agree to work with fabrication shops referenced in the Addendum. This joint effort will be directed at improving fabricators' competitiveness through the application of continuous improvement principles.

SAMPLE

(General Contractor) (Project Management Firm)	Sheet Metal Workers' International Assoc. Local #25

PROJECT LABOR AGREEMENT

COVERING INTERIOR RENOVATION, CONSTRUCTION & UPGRADES,
135 W. HANOVER STREET, TRENTON, MERCER COUNTY
DPMC PROJECT A1349-00

LETTER OF ASSENT

Re: Project Labor Agreement
Mercer County and Vicinity Building & Trades Council, AFL-CIO and the State of New Jersey, Department of the Treasury, Division of Property Management and Construction (the "Agreement")

The undersigned, as a Contractor, or a Subcontractor on a Contract which is part of large construction project for the State of New Jersey, for and in consideration of the award of a Contract to perform work on said Project, and in further consideration of the mutual promises made in the Project Labor Agreement, a copy of which was received and is acknowledged, hereby:

(1) On behalf of itself and all its employees, accepts and agrees to be bound by the terms and conditions of the Project Labor Agreement, together with any and all amendments and supplements now existing or which are later made thereto, and understands that any act of non-compliance with all such terms and conditions will subject the non-complying Contractor or employee(s) to being prohibited from the Project Site until full compliance is obtained.

(2) Certifies that it has no commitments or agreements that would preclude its full compliance with the terms and conditions of said Projects Labor Agreement.

(3) Agrees to secure from any Contractor(s) (as defined in said Project Labor Agreement) which is or becomes a Subcontractor(s) (of any tier), a duly executed Letter of Assent in form identical to this document prior to commencement of any work.

SAMPLE

_____
Company Name

By: _____ Contract Number __A1349-00__

Title: _____ Contractor_____

Date: _____

cc: (Unions employed by Contractor)

STATEMENT OF ASSURANCES

ADDITIONAL FEDERALLY FUNDED AGREEMENT PROVISIONS APPLICABLE TO CARES ACT AND AMERICAN RESCUE PLAN ACT FUNDED PROJECTS

The purpose of this Statement of Assurances is to list requirements applicable to programs funded in whole or in part by the Coronavirus Relief Fund (Fund), established by the Coronavirus Aid, Relief, and Economic Security (CARES) Act, and/or by Coronavirus State and Local Fiscal Recovery Funds (SLFRF), established by the American Rescue Plan Act of 2021 (ARPA). Not all of the requirements listed herein shall apply to all activities or work under the Contract.

As used herein, **"Contractor"** and **"Consultant"** refer to any contractors or consultants awarded a Contract to provide goods or perform services in connection with the Project and paid with monies under the SLFRF or Fund.

Contractor/Consultant agrees to comply with all *applicable* federal laws, guidelines and standards in a manner satisfactory to the State and the U.S. Treasury Department, including all administration and compliance requirements set forth by this Statement of Assurances. To the extent that Contractor/Consultant utilizes any subconsultants/subcontractors, Contractor/Consultant shall require and ensure that each subconsultant/subcontractor complies with all *applicable* federal laws, guidelines and standards; any subcontracts entered into by Contractor/Consultant shall set forth these requirements.

The failure to list herein a legal requirement applicable to services performed by Contractor/Consultant does not relieve the Contractor/Consultant from complying with that requirement.

A. GENERAL PROVISIONS

1. Under provisions of the Hatch Act that limit the political activity of employees, Fund and/or SLFRF funds shall not be used to finance the use of facilities or equipment for political purposes or to engage in other partisan political activities, such as candidate forums, voter transportation, or voter registration. However, a facility originally assisted with CARES and/or ARPA funds may be used on an incidental basis to hold political meetings, candidate forums, or voter registration campaigns, provided all parties and organizations have access to the facility on an equal basis, and are assessed equal rent or use charges, if any.

2. Under provisions of the Byrd Anti-Lobbying Amendment, 31 U.S.C. 1352, Contractors/Consultants that apply or bid for an award exceeding $100,000 must file the required certification, Attachment A hereto. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal

funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

3. No federally appointed funds shall be used for lobbying purposes regardless of level of government, in accordance with 2 CFR 200.450 and 31 CFR Part 21.

4. Contractors/Consultants that apply or bid for an award exceeding $100,000 must comply with the drug-free workplace requirements of the Drug-Free Workplace Act of 1988 and 31 CFR Part 20.

B. **PERSONALLY IDENTIFIABLE INFORMATION:** To the extent the Contractor/Consultant receives personally identifiable information, it will comply with the Privacy Act of 1974 and applicable rules and regulations related to the protection of personally identifiable information. The term "personally identifiable information" refers to information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, etc., either alone or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name, etc. See 2 CFR 200.79 & OMB M-07-16. Contractor/Consultant shall require all persons that have access to personally identifiable information (including subcontractors/subconsultants and their employees) to sign a Non-Disclosure Agreement.

C. FINANCIAL MANAGEMENT AND PROCUREMENT

1. *To the extent applicable*, Contractor/Consultant shall adhere to the principles and standards as set forth in the OMB Uniform Administrative Requirements, Cost Principles and Audit Requirements for Federal Awards (2 CFR Part 200).

2. Debarment and Suspension: Contractor/Consultant shall comply with all *applicable* laws pertaining to financial management, including 2 CFR Part 180 and 31 CFR Part 19 which prohibit the making of any contract award or permitting any award (sub grant or contract) at any tier to any party that is debarred or suspended or is otherwise excluded from or ineligible for participation in federal assistance programs. To the extent that it uses subcontractors or subconsultants, Contractor/Consultant must verify that none of them are on the List of Parties Excluded from Federal Procurement or Non-procurement Programs in the government-wide System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR Part 180 that implement Executive Orders 12549 and 12689, "Debarment and Suspension," as set forth at 2 CFR Part 2424. No Contractors, Consultants, or Subcontractors that are on the List may receive any Fund or SLFRF funds.

3. Conflict of interest rules, as set forth in Section 4019 of the CARES Act and 2 CFR § 200.318(c)(2) apply. Contractor/Consultant shall disclose in writing any potential conflict of interest to DPMC and shall complete the required certification, Attachment B hereto.

4. *To the extent applicable*, Contractor/Consultant shall comply with the procurement standards in the Uniform Guidance at 2 CFR § 200.317 through § 200.327.

5. Procurement of Recovered Materials: Contractor/Consultant must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include: (1) procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; (2) procuring solid waste management services in a manner that maximizes energy and resource recovery; and (3) establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

6. Domestic Preferences for Procurement: (a) As appropriate and to the extent consistent with law, Contractor/Consultant should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all subcontracts and purchase orders for work or products under this award.

   (b) For purposes of this section:

   (1) ‘‘Produced in the United States’’ means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

   (2) ‘‘Manufactured products’’ means items and construction materials composed in whole or in part of nonferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

7. Requirements regarding notification to employees of whistleblower protections in accordance with 41 U.S.C. § 4712 apply.

8. *To the extent applicable*, Contractor/Consultant shall comply with the requirements of the Uniform Relocation Assistance and Real Property Acquisitions Act of 1970, 42 U.S.C. §§ 4601-4655, and implementing regulations.

D. RECORDS AND RECORDS RETENTION

1. In accordance with 2 CFR § 200.333, Contractor/Consultant shall retain financial records, supporting documents, statistical records, and all other records pertinent to this Contract. The retention period shall be the longer of three (3) years after the expiration or termination of this Contract, or three years after the submission of the annual performance and evaluation report in which the project is reported on for the final time. Notwithstanding the above, if any litigation, claim, or audit pertaining to the Contract is started before the expiration of the applicable retention period, records must be retained until completion of the action and resolution of all issues that arise from it, or until the end of the required retention period, whichever is later.

2. Contractor/Consultant shall provide the State, including their representatives or agents, access to and the right to examine all records, books, papers, or documents related to the Contract and the use of Fund or SLFRF funds.

E. FEDERAL LABOR STANDARDS: *To the extent applicable*, Contractor/Consultant shall comply with Federal Labor Standards, including:

1. Davis-Bacon Act, 40 U.S.C. 3141-3149, as amended: All laborers and mechanics (as defined at 29 CFR §5.2) employed by Contractor/Consultant (including its subcontractors/subconsultants) in connection with construction contracts over $2,000, must be paid wages at rates not less than those prevailing on similar construction in the locality pursuant to the Davis-Bacon Act (40 U.S.C. §3141 et seq.), as amended and as supplemented by Department of Labor regulations, 29 C.F.R. Part 5; in addition, Contractors/Consultants must pay wages not less than once per week; except that these requirements do not apply to the rehabilitation of residential property if such property contains less than 8 units;
2. The Contract Work Hours and Safety Standards Act (40 U.S.C. 3701 et seq.), as supplemented by Department of Labor regulations (29 CFR Part 5), requiring that mechanics and laborers (including watchmen and guards) employed on federally assisted contracts of $100,000 or greater be paid wages of not less than one and one-half times their basic wage rates for all hours worked in excess of forty hours in a work-week. The requirements of 40 U.S.C. § 3704 apply to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous;
3. The Federal Fair Labor Standards Act (29 U.S.C. 201 et seq.), requiring that covered nonexempt employees be paid at least the minimum prescribed wage, and also that they be paid one and one-half times their basic wage rate for all hours worked in excess of the prescribed work-week;
4. The Copeland "Anti-Kickback" Act (18 U.S.C. 874) as supplemented in Department of Labor regulations (29 CFR part 3), which apply to contracts and subcontracts for construction, prosecution, completion, or repair of public buildings, public works or buildings, or works financed in whole or in part by Federal loans or grants, and requires payment of wages once a week and allows only permissible payroll deductions -- Contractor/Consultant is prohibited from inducing, by any means, any person employed in the construction , completion, or repair of public work or building or work financed by Federal loans or grants, to give up any part of the compensation to which he or she is otherwise entitled;
5. Department of Labor regulations in parallel with the requirements above:

    a. 29 CFR part 1: Procedures for Predetermination of Wage Rates

    b. 29 CFR part 5: Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction (Also, Labor Standards Provisions

Applicable to Non-construction Contracts Subject to the Contract Work Hours and Safety Standards Act)

c. 29 CFR part 6: Rules of Practice for Administrative Proceedings Enforcing Labor Standards In Federal and Federally Assisted Construction Contracts and Federal Service Contracts

d. 29 CFR part 7: Practice Before the Administrative Review Board With Regard to Federal and Federally Assisted Construction Contracts.

F. FAIR HOUSING AND NON-DISCRIMINATION

1. *To the extent applicable*, Contractor/Consultant shall comply with the following fair housing and non-discrimination laws. Any act of unlawful discrimination committed by Contractor/Consultant or failure to comply with applicable laws shall be grounds for termination of the Contract.

   a. Title VI of the Civil Rights Act of 1964, as amended, 42 U.S.C. §2000d et seq., and Treasury's implementing regulations at 31 CFR Part 22), which prohibit discrimination on the basis of race, color, or national origin, under programs or activities receiving federal financial assistance. .
   b. The Fair Housing Act (Title VIII of the Civil Rights Act of 1968, as amended, 42 U.S.C. 3601–3619), which requires administering all programs and activities relating to housing and community development in a manner to affirmatively further fair housing. Title VIII further prohibits discrimination against any person in the sale or rental of housing, or the provision of brokerage services, including in any way making unavailable or denying a dwelling to any person, because of race, color, religion, sex, national origin, handicap or familial status.
   c. Title II of the Civil Rights Act of 1968 (25 U.S.C. 1301-1303), which prohibits discrimination because of race, color, religion, or natural origin in certain places of public accommodation.
   d. Architectural Barriers Act (ABA) of 1968, 42 U.S.C. 4151 et seq. The ABA requires access to buildings designed, built, altered, or leased by or on behalf of the federal government or with loans or grants, in whole or in part, from the federal government. As used in the ABA, the term "building" does not include privately owned residential structures not leased by the government for subsidized housing programs.
   e. Title IX of the Education Amendments Act of 1972, 20 U.S.C. 1681 et seq., which prohibits discrimination on the basis of sex in any federally funded education program or activity.
   f. Section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. §794, which provides that no otherwise qualified individual shall solely by reason of his or her handicap be excluded from participation, denied program benefits, or subjected to discrimination under any program or activity receiving federal funding assistance.
   g. Section 508 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. §794d, which requires Federal agencies to make their electronic and information technology (EIT) accessible to people with disabilities, and applies to all federal agencies when they develop, procure, maintain or use electronic and information technology.

h. Age Discrimination Act of 1975, as amended, 42 U.S.C. 6101 et seq., and Treasure's implementing regulations at 31 CFR Part 23, which prohibit discrimination on the basis of age in programs and activities receiving federal financial assistance.
i. Title II of the Americans with Disabilities Act of 1990, 42 U.S.C. 12101 et seq., as amended by the ADA Amendments Act of 2008, which prohibits discrimination on the basis of disability under programs, activities, and services provided or made available by state and local government or instrumentalities or agencies thereto.
j. Housing for Older Persons Act of 1995 ("HOPA") (42 U.S.C. 3607), which governs housing developments that qualify as housing for persons age 55 or older.
k. Accessibility requirements contained in Title III of the Americans with Disabilities Act of 1990 (42 U.S.C. 12181 et seq.).
l. Executive Order 11063: Equal Opportunity in Housing, November 20, 1962, as amended by Executive Order 12259, and the regulations issued pursuant thereto, which pertain to equal opportunity in housing and non-discrimination in the sale or rental of housing built with federal assistance.
m. Executive Order 11246 (Johnson), September 24, 1965, as amended by Executive Order 11375 (Johnson), October 13, 1967, as amended by Executive Order 13672 (Obama), July 21, 2014, which prohibit discrimination in employment on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin. Further, contractors and subcontractors on federal and federally assisted construction contracts shall take affirmative steps to ensure that equal opportunity is provided in all aspects of their employment, including, but not limited to: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training and apprenticeship.

G. CONTRACTING WITH SMALL AND MINORITY BUSINESSES, WOMEN'S BUSINESS ENTERPRISES, AND LABOR SURPLUS AREA FIRMS

1. Contractor/Consultant shall take all necessary affirmative steps to ensure contracting opportunities are provided to small and minority businesses, women's business enterprises, and labor surplus area firms. As used in this contract, the terms "minority business" and "women's business enterprise" means a business that is at least fifty-one percent (51%) owned and controlled by minority group members or women. For purposes of this definition, "minority group members" are African-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and Native Americans. Contractor/Consultant may rely on written representations by businesses regarding their status as minority, women and veteran businesses in lieu of an independent investigation.

2. Affirmative steps shall include:

   a. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

b. Ensuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources, for goods and/or services required in furtherance of the Contract;
c. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;
d. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises; and
e. Using the service and assistance, as appropriate, of organizations such as the Small Business Administration, and the Minority Business Development Agency of the U.S. Department of Commerce; and
f. Requiring the subcontractor, if subcontracts are to be let, to take the affirmative steps listed in subparagraphs (a) through (e) of this section.

H. ENVIRONMENTAL REGULATORY COMPLIANCE

To the extent applicable, Contractor/Consultant must comply with federal environmental laws and regulations, including but not limited to:

1. Floodplain management and wetland protection:
    a. Executive Order 11990, Protection of Wetlands (May 24, 1977) (42 FR 26961), 3 CFR, 1977 Comp., p. 121, as interpreted by HUD regulations at 24 CFR 55, particularly sections 2 and 5 of the order;
    b. Executive Order 11988, Floodplain Management, May 24, 1977 (42 FR 26951), 3 CFR, 1977 Comp., p. 117, as interpreted in HUD regulations at 24 CFR part 55, particularly section 2(a) of the order;
2. The Coastal Zone Management Act of 1972 (16 U.S.C. § 1451 et seq.), as amended, particularly sections 307(c) and (d) (16 U.S.C. §§1456(c) and(d));
3. The National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq.
4. In relation to water quality:
    a. Executive Order 12088, as amended by Executive Order 12580, relating to the prevention, control and abatement of water pollution;
    b. The Safe Drinking Water Act of 1974 (42 U.S.C. §§ 201, 300(f) et seq. and U.S.C. §349), as amended, particularly Section 1424(e) (42 U.S.C. §§ 300h-303(e)), which is intended to protect underground sources of water. No commitment for federal financial assistance can be entered into for any project which the U.S. Environmental Protection Agency ("EPA") determines may contaminate an aquifer which is the sole or principal drinking water source for an area (40 CFR 149); and
    c. The Federal Water Pollution Control Act of 1972, as amended, including the Clean Water Act of 1977, Public Law 92-212 (33 U.S.C. §1251, et seq.) which provides for the restoration and maintenance of the chemical, physical and biological integrity of the nation's water.

5. Endangered Species Act of 1973 (16 U.S.C. §1531 et seq.), as amended, particularly section 7 (16 U.S.C. §1536);
6. The Fish and Wildlife Coordination Act of 1958, as amended;
7. Wild and Scenic Rivers Act of 1968 (16 U.S.C. § 1271 et seq.), particularly sections 7(b) and (c) (16 U.S.C. §1278(b) and (c));
8. Executive Order 11738 (Nixon), Sept. 10, 1973, providing for administration of the Clean Air Act and the Federal Water Pollution Control Act With Respect to Federal Contracts, Grants, or Loans, and EPA regulations (40 CFR 15);
9. The Clean Air Act of 1970 (42 U.S.C. § 7401 et seq.) as amended, particularly sections 176(c) and (d) (42 U.S.C. § 7506(c) and (d)), and 40 CFR Parts 51 and 93, which prohibit engaging in, supporting in any way, providing financial assistance for, licensing or permitting, or approving any activity which does not conform to State or Federal implementation plans for national primary and secondary ambient air quality standards.
10. The Farmland Protection Policy Act of 1981, 7 U.S.C.A. §4201 et seq., particularly sections 1540(b) and 1541 (7 U.S.C. §4201(b) and §4202), and Farmland Protection Policy, 7 CFR 658, which require recipients of federal assistance to minimize the extent to which their projects contribute to the unnecessary and irreversible commitment of farmland to nonagricultural uses;
11. Noise abatement and control requirements at 24 CFR 51B;
12. Explosive and flammable operations requirements at 24 CFR 51C;
13. Requirements at 24 CFR 58.5(i) relating to toxic chemicals and radioactive materials;
14. Environmental Justice, Executive Order 12898—Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, February 11, 1994 (59 FR 7629, Feb. 16, 1994), and Executive Order 14096 – Revitalizing Our Nation's Commitment to Environmental Justice for All, April 21, 2021 (88 FR 25251, April 26, 2023).
15. Clean Air Act and Water Pollution Control Act: For all contracts and subgrants in excess of $150,000, Contractor/Consultant must comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act, 42 U.S.C. §§ 7401-7671(q), and the Federal Water Pollution Control Act, as amended, 33 U.S.C. §§ 1251-1387. Violations must be reported to DPMC which will, in turn, report the violation to the appropriate Federal agency or department.

I. EQUAL EMPLOYMENT OPPORTUNITY

1. All federally assisted construction contracts must include the equal opportunity clause provided under 41 CFR §60-1.4(b). Federally assisted construction contracts (defined in 41 CFR §60-1.3) include any agreement or modification thereof between any applicant and a person for construction work which is paid for in whole or in part with funds obtained from the federal government. Construction work is defined as "the

construction, rehabilitation, alteration, conversion, extension, demolition or repair of buildings, highways, or other changes or improvements to real property, including facilities providing utility services. The term also includes the supervision, inspection, and other onsite functions incidental to the actual construction." 41 CFR §60-1.3.

2. **Pursuant to 41 CFR §60-1.4(b), the following language shall be included in all federally assisted construction contracts and subcontracts:**

   During the performance of this contract, the contractor agrees as follows:

   (1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

   (2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

   (3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

   (4) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union or workers' representatives of the contractor's commitments under section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(8) The contractor will include the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

J. ADDITIONAL MISCELLANEOUS CONTRACT PROVIONS

1. Rights to Inventions Made under a Contract or Agreement: For Federal awards that meet the definition of "funding agreement" under 37 CFR § 401.2 (a), if Contractor/Consultant wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," Contractor/Consultant must comply with the requirements of 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts, and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

2. Prohibition on certain telecommunications and video surveillance services or equipment: Contractor/Consultant is prohibited from obligating or expending loan or grant funds to:

(1) Procure or obtain;
(2) Extend or renew a contract to procure or obtain; or
(3) Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115–232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
(i) For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
(ii) Telecommunications or video surveillance services provided by such entities or using such equipment.
(iii) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

K. MISCELLANEOUS PROVISIONS

Attachment A: Byrd Anti-Lobbying Certification
Attachment B: Conflict of Interest Certification

CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents of all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, United States Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Organization: _____

Street address: _____

City, State, Zip: _____

_____
CERTIFIED BY: (type or print)

_____
TITLE:

_____ _____
(signature) (date)

Approved by OMB

0348-0046

Disclosure of Lobbying Activities

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352

(See reverse for public burden disclosure)

1. Type of Federal Action: a. contract ____ b. grant c. cooperative agreement d. loan e. loan guarantee f. loan insurance	**2. Status of Federal Action:** a. bid/offer/application _____ b. initial award c. post-award	**3. Report Type:** a. initial filing _____ b. material change **For material change only:** Year _____ quarter _____ Date of last report_____

4. Name and Address of Reporting Entity: ____ Prime _____ Subawardee Tier_____, if Known: **Congressional District, if known:**	**5. If Reporting Entity in No. 4 is Subawardee,** Enter Name and Address of Prime: **Congressional District, if known:**
6. Federal Department/Agency:	**7. Federal Program Name/Description:** CFDA Number, *if applicable*: _____
8. Federal Action Number, *if known:*	**9. Award Amount**, *if known:* **$**
10. a. Name and Address of Lobbying Registrant *(if individual, last name, first name, MI):*	**b. Individuals Performing Services** *(including address if different from No. 10a)* *(last name, first name, MI):*
11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.	**Signature: _____** **Print Name:_____** **Title:_____** **Telephone No.: _____ Date: _____**
Federal Use Only	**Authorized for Local Reproduction** **Standard Form - LLL (Rev. 7-97)**

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.

2. Identify the status of the covered Federal action.

3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.

4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.

5. If the organization filing the report in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.

6. Enter the name of the federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.

7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.

8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitations for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Included prefixes, e.g., "RFP-DE-90-001."

9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.

10. (a) Enter the full name, address, city, State and zip code of the lobbying registrant under the Lobbying Disclosure Act of 1995 engaged by the reporting entity identified in item 4 to influence the covered Federal action.

    (b) Enter the full names of the individual(s) performing services, and include full address if different from 10(a). Enter Last Name, First Name, and Middle Initial (MI).

11. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

According to the Paperwork Reduction Act, as amended, no persons are required to respond to a collection of information unless it displays a valid OMB control Number. The valid OMB control number for this information collection is OMB No. 0348-0046. Public reporting burden for this collection of information is estimated to average 10 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget,
Paperwork Reduction Project (0348-0046), Washington, DC 20503

CONFLICTS OF INTEREST CERTIFICATION

Section 4019 of the Coronavirus Aid, Relief, and Economic Security Act ("CARES Act") prohibits entities in which certain government officials and some of their immediate family members have a "controlling interest" from participating in certain government programs. Section 4019(c) of the CARES Act requires the principal executive officer and principal financial officer (or individuals performing similar functions) of any recipient of CARES Act funds to certify to the Secretary of the Treasury and the Board of Governors of the Federal Reserve System that the recipient is not a Covered Entity.

For definitions of "Covered Entity," "Covered Individual," and "Controlling Interest," see Section 4019(a) of the CARES Act.

Good Faith Certification:

Pursuant to section 4019(c) of the CARES Act, to the best of my knowledge and based on reasonable diligence, I certify to the Secretary of the Treasury (Secretary) and the Board of Governors of the Federal Reserve System (Board) that Contractor/Consultant is not a covered entity, as that term is defined in Section 4019(a)(2) of the CARES Act.

I further certify that Contractor/Consultant will immediately notify the Secretary and the Board if Contractor/Consultant becomes a covered entity, as that term is defined in section 4019(a)(2) of the CARES Act. If Contractor/Consultant becomes a covered entity, Contractor/Consultant will not enter into any transaction with the State of New Jersey involving CARES Act funds.

Chief Executive Officer

By: _____

Title: _____

Date: _____

Chief Financial Officer

By: _____

Title: _____

Date: _____

INTERIOR CONSTRUCTION, RENOVATION AND UPGRADES
STATE OFFICE BUILDING
TRENTON, NJ 08618
DPMC NO: A1349-00
L+G NO: 21567

END OF TABLE OF CONTENTS

SECTION 035300 – POLISHED CONCRETE FLOOR TOPPINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fast-setting, high strength, cementitious, non-shrink, decorative, exposed aggregate polishable architectural topping & resurfacer for interior and exterior flooring installations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans indicating substrates, locations, and average depths of topping based on survey of substrate conditions.

C. Samples: Submit samples for approval. Samples must be of materials specified and of suitable size as required to accurately represent each color and texture used on project. Prepare each sample using the same tools and techniques for actual project application.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Maintenance Data: For inclusion in maintenance manual.
1. Include manufacturer’s instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under intended use.
2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance

C. Test Reports:

1. Submit testing data that confirms compliance with specified performance requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

B. Mock-up: Provide a mock-up of the complete system sample panel, sized to 48”x 48”, using workmen, equipment, and techniques proposed for use on the project.
1. Mock-up must be reviewed for uniformity of depth and thickness, finish color and texture, and overall quality of construction.
2. The approved panel will become the standard of comparison for finished work for the project.
3. The approved panel must remain on site throughout the construction process and until final acceptance.
4. Approved mock-up may become part of the completed work if undisturbed at time of substantial completion.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place polished concrete floor toppings only when ambient temperature and temperature of substrates are between 50 and 90 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Basis-of-Design Product: Subject to compliance with requirements, provide CTS Cement Manufacturing Corp.; Rapid Set TRU PC Gray or comparable product by one of the following:

1. Ardex Americas.
2. The Euclid Chemical Company.
3. Laticrete International, Inc.
4. Or Approved Equal.

2.2 PERFORMANCE REQUIREMENTS

A. Fast Setting, High Strength, Non-Shrink Cementitious Polishable Overlay
1. Minimum performance requirements:
a. Compressive strength: ASTM C109
1) 4 hours = 2,800 psi
2) 24 hours = 5,000 psi

3) 28 days = 7,000 psi

b. Tensile strength: ASTM C109
   1) 7 days = 210 psi, minimum
   2) 28 days = 365 psi, minimum

B. Finished Sheen/Gloss level: Polished Concrete Level 2 – Medium Gloss: At a distance of 30 to 50 feet, the floor will clearly reflect from side and overhead lighting and achieve gloss meter readings of 41 to 55.

C. Floor flatness and levelness: Substrate floor flatness and levelness should be tested prior to installation of the overlay according to ASTM E1155 Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers by an independent testing agency experienced with the testing procedure and possessing the necessary equipment.

D. Coefficient of Friction:
   1. Achieve following coefficient of friction by field quality control testing in accordance to the following standards:
      a. ANSI B101.1 Static Coefficient of Friction – Achieve a minimum of .5 for level floor surfaces.
      b. ANSI B101.3 Dynamic Coefficient of Friction - Achieve a minimum of .35 for level floor surfaces

2.3 MATERIALS

A. Fast Setting, High Strength, Cementitious Polishable Overlay

B. Aggregate: Provide aggregates from a single source with a documented satisfactory service record in similar applications and service conditions using similar aggregates and cementitious materials.
   1. Fine and coarse aggregates must conform to ASTM C33/C33M.
   2. Lightweight aggregates must conform to ASTM C330/C330M.
   3. Decorative Broadcast Aggregates: To be selected by Architect from the Manufacturer's full range.

C. Liquid Densifier: An aqueous solution of Silicon Dioxide dissolved in one of the following Hydroxides that penetrates into the concrete surface and reacts with the Calcium Hydroxide to provide a permanent chemical reaction that hardens and densifies the wear surface of the cementitious portion of the concrete. All of the following have the same chemistry varying only by the alkali used for solubility of the Silicon Dioxide.
   1. Sodium Silicate
   2. Potassium Silicate
   3. Lithium Silicate
   4. Alkalis solution of Colloidal Silicates or Silica

D. Water: Potable and at a temperature of not more than 70 deg F.

E. Primer: Product of topping manufacturer recommended in writing for substrate, conditions, and application indicated.

F. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to topping.

G. Admixtures: Must conform to ASTM C494. All additives and admixture materials must be approved by the manufacturer prior to use.

H. Sand: Washed and kiln dried angular cut #20 - #30 grit silica sand for use with primer.

I. Joint Sealants: Comply with manufacturer's recommendations and specification section 079200 Joint Sealants. Color to match adjacent finished floor surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test, ASTM F1869: Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 85 percent relative humidity level measurement, or as recommended by hydraulic cement underlayment manufacturer.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with topping according to manufacturer's written instructions.

3.3 INSTALLATION

A. Mix and install topping components according to manufacturer's written instructions.

1. Close areas to traffic during topping installation and for time period after installation recommended in writing by manufacturer.
2. Coordinate installation of components to provide optimum adhesion to substrate and between coats.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through topping.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Install topping to produce uniform, level surface.

1. Install a final layer without aggregate to product surface.
2. Feather edges to match adjacent floor elevations.

D. Cure topping according to manufacturer's written instructions. Prevent contamination during installation and curing processes.

E. The minimum installation thickness must be 3/8″ minimum. For high-load, rubber wheeled traffic areas, nominal thickness must be 1/2″ minimum.

F. Apply surface sealer at rate recommended by manufacturer.

G. Remove and replace topping areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 INSTALLATION TOLERANCES

A. Finish and measure surface, so gap at any point between gypsum cement underlayment surface and an unleveled, freestanding, 10-foot-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

3.5 CURING

A. Allow topping to cure for a minimum of four (4) hours prior to saw cutting joints.

B. Prevent damage to overlay and protect from all traffic for the length of time recommended by the manufacturer.

3.6 JOINT CUTTING, PREPARATION AND FILLING

1. Joints must be installed prior to the polishing process.
2. Honor all existing joints. Locate original joint locations and saw cut through topping into the original joint. Saw blade must penetrate to the depth of the original joint or 2” deep, whichever is smaller. Prefill joints greater than 2” deep.
3. Ensure saw-cut joint is completely free of dust/debris/laitance.

4. Apply stain prevention film or other masking agent along surface on both sides of the joint to avoid residual staining.
5. Install joint filler. Fill from the bottom of the joint, being careful to avoid entrapping air.
6. Slightly overfill joint to a crowned profile.
7. After sufficient cure, razor excess filler leaving a filler profile that is flush with floor surface.
8. If filler profile is low/concave, remove top 1/2” of filler and re-apply.

3.7 POLISHING

A. Allow overlay to cure for a minimum of 24 hours before beginning the polishing process.

B. Use overlay manufacturer’s approved polishing system.

C. Comply with overlay manufacturer’s and polishing equipment manufacturer’s published Technical Bulletins and guidelines.

3.8 SEALING

A. Apply densifiers, sealers, guards or stain protectors per manufacturers’ instructions.

B. Achieve waterproofing, hardening, dust-proofing, and abrasion resistance of the surface without changing the designed aesthetics of the finish.

3.9 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035300

SECTION 101423 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including State of New Jersey Instructions to Bidders and General Conditions and other Div 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Panel signs.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

B. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.4 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
4. Show locations of electrical service connections.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Panel Signs: Full-size Sample.
2. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
3. Exposed Accessories: Full-size Sample of each accessory type.
4. Full-size Samples, if approved, will be returned to Contractor for use in Project.

E. Product Schedule: For panel signs. Use same designations indicated on Drawings or specified.

1.6 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.

b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in ICC A117.1.

2.2 PANEL SIGNS

A. Panel Sign Insert drawing designation: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AGS
   b. Cab Signs
   c. InPro Corporation
   d. Sign Pro
   e. Kroy Sign Systems
   f. Or Approved Equal

2. Laminated-Sheet Sign: Photopolymer Sandblasted polymer Stainless Steel face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.

   a. Composite-Sheet Thickness: 0.125 inch.
   b. Surface-Applied, Flat Graphics: Applied paint.
   c. Surface-Applied, Raised Graphics: Applied polymer characters and Braille.

3. Sign-Panel Perimeter: Finish edges smooth.

   a. Edge Conditionat Vertical Edges at Horizontal Edges: Square cut.
   b. Corner Condition in Elevation: Rounded.

4. Mounting: Manufacturer's standard method for substrates indicated Surface mounted to wall with concealed anchors countersunk flathead through fasteners.
5. Surface Finish and Applied Graphics:
   a. Integral Stainless-Steel Finish: As selected by Architect from full range of industry finishes.
   b. Integral Acrylic Sheet Color: As selected by Architect from full range of industry colors.
   c. Overcoat: Manufacturer's standard baked-on clear coating.

6. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.
7. Flatness Tolerance: Sign shall remain flat or uniformly curved under installed conditions as indicated on Drawings and within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner.

2.3 PANEL-SIGN MATERIALS

A. Steel Materials:

1. Metallic-Coated Steel Sheet: ASTM A653/A653M, G90 coating, either commercial or forming steel.
2. Steel Sheet: Uncoated, cold-rolled, ASTM A1008/A1008M, commercial steel, Type B, exposed or electrolytic zinc-coated, ASTM A879/A879M, Coating Designation 08Z, with steel-sheet substrate according to ASTM A1008/A1008M, commercial steel, exposed.
3. Steel Members Fabricated from Plate or Bar Stock: ASTM A529/A529M or ASTM A572/A572M, 42,000-psi minimum yield strength.
4. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

C. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

D. Fiberglass Sheet: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.

E. Polycarbonate Sheet: ASTM C1349, Appendix X1, Type II (coated, mar-resistant, UV-stabilized polycarbonate), with coating on both sides.

F. PVC Sheet: Manufacturer's standard, UV-light stable, PVC plastic.

G. Plastic-Laminate Sheet: NEMA LD 3, general-purpose HGS grade, 0.048-inch nominal thickness.

H. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.

I. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. Exposed Metal-Fastener Components, General:

    a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
    b. Fastener Heads: For nonstructural connections, use oval countersunk screws and bolts with tamper-resistant Allen-head spanner-head or one-way-head slots unless otherwise indicated.

3. Sign Mounting Fasteners:

    a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
    b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
    c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.

4. Inserts: Furnish inserts to be set by other installers into concrete or masonry work.

B. Adhesive: As recommended by sign manufacturer.

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.

E. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace signs for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into indicated sign surface to produce precisely formed copy, incised to uniform depth.

1. Engraved Metal: Fill engraved graphics with manufacturer's standard baked enamel.
2. Engraved Opaque Acrylic Sheet: Fill engraved graphics with manufacturer's standard enamel.
3. Face-Engraved Clear Acrylic Sheet: Fill engraved copy with manufacturer's standard enamel. Apply manufacturer's standard opaque background color coating to back face of acrylic sheet.
4. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.

C. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

D. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish to match sign-background color color unless otherwise indicated.
2. Stainless-Steel Brackets: Factory finish brackets with No. 4 finish unless otherwise indicated.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 METALLIC-COATED STEEL FINISHES

A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.

B. Factory Prime Finish: After cleaning and pretreating, apply an air-dried primer compatible with the organic coating to be applied over it.

C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

2.8 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, and prepare for coating according to coating manufacturer's written instructions.

1. For Baked-Enamel or Powder-Coat Finish: After cleaning, apply a conversion coating compatible with the organic coating to be applied over it.

B. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.

C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

2.9 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
2. Directional Satin Finish: No. 4.
3. Dull Satin Finish: No. 6.
4. Reflective, Directional Polish: No. 7.
5. Mirrorlike Reflective, Nondirectional Polish: No. 8.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchorage devices embedded in permanent construction are correctly sized and located to accommodate signs.

D. Verify that electrical service is correctly sized and located to accommodate signs.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Accessible Signage: Install in locations on walls as indicated on Drawings and according to the accessibility standard.

C. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.

3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
4. Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
7. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips 0.250 inch away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.
8. Magnetic Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position.
9. Shim-Plate Mounting: Provide 1/8-inch-thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

SECTION 230901 VARIABLE FREQUENCY DRIVE

PART 1 - GENERAL

1.1 Description

A. This specification covers variable frequency drives (VFDs) designated on the drawing schedules to be variable speed. All standard and optional features shall be included within the VFD panel.

B. The VFD shall be UL Type 1 or UL Type 12 as required on the schedule.

C. The VFD shall have been evaluated by UL and found acceptable for mounting in a plenum or other air handling compartment.

D. The VFD shall be tested to UL 508C.

1. The appropriate UL label shall be applied.

E. VFD shall be manufactured in ISO 9001, 2000 certified facilities.

F. The VFD shall be CE marked and conform to the European Union ElectroMagnetic Compatibility directive.

G. The VFD shall be UL listed for a short circuit current rating of 100 kAIC and labeled with this rating.

H. The VFD manufacturer shall supply the VFD and all necessary controls as herein specified.

I. The manufacturer shall have been engaged in the production of this type of equipment for a minimum of twenty years.

J. Power Requirements: provided by Division 26 electrical contractor

1.2 Warranties

A. The complete VFD shall be warranted by the manufacturer for a period of 3 years from date of Substantial Completion.

1. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service.

2. The warranty shall be provided by the VFD manufacturer and not a third party

3. A written warranty statement shall be provided with the submittals.

PART 2 - PRODUCTS

2.1 Manufacturers: provide product by one of the following:

1. Eaton Electrical Sector; Eaton Corporation; Cutler-Hammer Business Unit.

2. Rockwell Automation, Inc; Allen-Bradley Brand.

3. Yaskawa Electric America, Inc.

4. Or approved equal.

2.2 Description

A. The VFD shall convert incoming fixed frequency three-phase AC power into an adjustable frequency and voltage for controlling the speed of three-phase AC motors.

B. The VFD shall have a dual 5% impedance DC link reactor on the positive and negative rails of the DC bus to minimize power line harmonics and protect the VFD from power line transients. The chokes shall be non-saturating.

C. VFDs with saturating (non-linear) DC link reactors shall require an additional 3% AC line reactor to provide acceptable harmonic performance at full load, where harmonic performance is most critical.

D. The VFD's full load output current rating shall meet or exceed NEC Table 430-150.

E. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 135% of rated torque for up to 0.5 second while starting.

F. The VFD shall provide full motor torque at any selected frequency from 20 Hz to base speed while providing a variable torque V/Hz output at reduced speed.

G. A programmable automatic energy optimization selection feature shall be provided standard in the VFD. This feature shall automatically and continuously monitor the motor's speed and load to adjust the applied voltage to maximize energy savings.

H. The VFD must be able to produce full torque at low speed to operate direct drive fans

I. An automatic motor adaptation algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency.

J. Galvanic isolation shall be provided between the VFD's power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents.

K. VFD shall minimize audible motor noise through the use of an adjustable carrier frequency.

L. All VFDs shall contain integral EMI filters to attenuate radio frequency interference conducted to the AC power line.

2.3 Protective Features

A. A minimum of Class 20 I2t electronic motor overload protection for single motor applications shall be provided

B. Protection against input transients, loss of AC line or load phase, output short circuit, output ground fault, over voltage, under voltage, VFD over temperature and motor over temperature.

C. The VFD shall incorporate a programmable motor preheat feature to keep the motor warm and prevent condensation build up in the motor when it is stopped in a damp environment by providing the motor stator with a controlled level of current.

D. VFD shall include a “signal loss detection” algorithm with adjustable time delay to sense the loss of an analog input signal.

E. VFD shall catch a rotating motor operating forward or reverse up to full speed without VFD fault or component damage.

F. VFD shall include current sensors on all three output phases to accurately measure motor current, protect the VFD from output short circuits, output ground faults, and act as a motor overload.

G. If the temperature of the VFD’s heat sink rises to a critical level, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature.

H. In order to ensure operation during periods of overload, it must be possible to program the VFD to automatically reduce its output current to a programmed value during periods of excessive load. This allows the VFD to continue to run the load without tripping.

I. The VFD shall have temperature controlled cooling fan(s) for quiet operation, minimized losses, and increased fan life.

J. The VFD shall store in memory the last 10 alarms.

K. When used with a pumping system, the VFD shall be able to detect no-flow situations, dry pump conditions, and operation off the end of the pump curve.

2.4 Interface Features

A. Hand, Off and Auto keys shall be provided to start and stop the VFD and determine the source of the speed reference.

B. The VFD shall be programmable to provide a digital output signal to indicate whether the VFD is in Hand or Auto mode.

C. Password protected keypad with alphanumeric, graphical, backlit display can be remotely mounted.

D. All VFDs shall have the same customer interface.

E. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided.

F. A quick setup menu with factory preset typical HVAC parameters shall be provided on the VFD.

1. The VFD shall also have individual Fan, Pump, and Compressor menus specifically designed to facilitate start-up of these applications.

G. For fan flow tracking applications, the VFD shall be able to calculate the square root of any or all individual feedback signals so that a pressure sensor can be used to measure airflow.

H. The VFD's PID controller shall be able to actively adjust its setpoint based on flow

1. This allows the VFD to compensate for a pressure feedback sensor which is located near the output of the pump rather than out in the controlled system.

I. VFD shall be programmable to sense the loss of load.

2.5 Standard Control and Monitoring Inputs and Outputs

A. Four dedicated, programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.

B. Two terminals shall be programmable to act as either as digital outputs or additional digital inputs.

C. Two programmable relay outputs, Form C 240 V AC, 2 A, shall be provided for remote indication of VFD status.

D. Two programmable analog inputs shall be provided that can be either direct-or-reverse acting.

E. One programmable analog current output (0/4 to 20 mA) shall be provided for indication of VFD status.

1. This output shall be programmable to show the reference or feedback signal supplied to the VFD and for VFD output frequency, current and power.

2. It shall be possible to scale the minimum and maximum values of this output.

F. It shall be possible through serial bus communications to read the status of all analog and digital inputs of the VFD.

G. It shall be possible to command all digital and analog output through the serial communication bus.

2.6 Optional Control and Monitoring Inputs and Outputs

A. It shall be possible to add optional modules to the VFD in the field to expand its analog and digital inputs and outputs.

2.7 Serial Communications

A. The VFD shall include a standard EIA-485 communications port and capabilities to be connected to the following serial communication protocols at no additional cost and without a need to install any additional hardware or software in the VFD:

1. BACnet MS/TP

2. Option board only

2.8 Features

A. All features shall be built, mounted and tested by the VFD manufacturer.

1. The VFD manufacturer’s warranty shall apply to the entire assembly as shipped.

2. Packages built by third parties and do not carry the VFD manufacturer’s warranty shall not be allowed.

3. All options shall carry a UL / C-UL Enclosed Industrial Control Panel label.

4. All panels shall be marked for 100,000 amp short circuit current rating.

B. The enclosure rating of the VFD w/ options shall be consistent with the VFD rating of either NEMA/UL type 1 or NEMA/UL type 12, as required for the installation location and/or as called for on the schedule.

C. Three Contactor bypass shall be provided that allows operation of the motor via line power in the event of a failure of the VFD.

1. Motor control selection shall be though either a VFD output contactor or a bypass contactor that is electrically interlocked to ensure that both contactors are not energized simultaneously.

2. A third contactor, the drive input contactor, shall be supplied as standard.

3. This allows the powering of the VFD with the motor off or operating in bypass mode for testing, programming and troubleshooting purposes.

D. The Three Contactor bypass shall include the following interface and control features:

1. Mode selection via a four position DRIVE/OFF/BYPASS/TEST switch.

E. Bypass package shall include an External Safety interlock that will disable motor operation in either bypass or VFD when open

F. Fire-mode bypass operation shall be standard

1. When activated via a contact closure, the motor shall transfer to bypass (line power) regardless of the mode selected.

2. All calls to stop the motor shall be ignored.

3. These include the opening of the start command, an external safety trip or the tripping of the motor overload.

4. Fire-mode operation will take precedence over all other commands.

G. The bypass must include a selectable time delay of 0 to 60 seconds before the initiation of bypass operation

1. When transferring from VFD to bypass modes, the time delay starts after the motor has decelerated to zero speed

2. This delay allows the BAS to prepare for bypass operation

3. Bypass packages that do not include a time delay, or do not include a selectable delay period, will not be acceptable.

H. Automatic bypass shall be selectable.

2.9 Protective features

A. Main input disconnect shall be provided that removes power from both the bypass and VFD.

B. Main input motor rated fuses that protect the entire package.

C. VFD only fast acting input fuses shall be provided. Packages that include only main input motor rated fusing or circuit breaker are not acceptable.

D. Overload protection shall be supplied in bypass mode

E. This overload shall supply minimum class 20 protection as well as wide adjustable current setting for complete motor protection when operating on line power.

F. Overload protection shall include phase loss and phase imbalance protection.

G. For 460V/600V units 75 Hp and below and 208V/230V units 40 Hp and below, low voltage contactor operation shall be maintained down to 70% of the unit's nominally rated voltage, to ensure VFD operation.

H. For 460V/600V units 75 Hp and below and 208V/230V units 40 Hp and below, the VFD shall be able to operate the motor at a reduced load with the loss of any one of the three phases of power.

2.10 Service Conditions

A. Ambient temperature, continuous, full speed, full load operation:

1. 0 to 45°C on Non-Bypass units

2. 14 to 113°F on Non-Bypass units

3. 0 to 40°C on Bypass units

4. 14 to 104°F on Bypass units

5. 5 to 95% relative humidity, non-condensing.

6. Elevation to 1,015 metres without derating.

7. Elevation to 3,300 feet without derating.

8. AC line voltage variation, -10 to +10% of nominal with full output.

9. All power and control wiring shall be from the bottom.

10. All VFDs shall be plenum rated.

2.11 Quality Assurance

A. When the complete VFD is provided by the contractor, all testing and inspections indicated in the specifications shall be performed by a DPMC prequalified firm and arranged and paid for by the Contractor and in no situation by the Owner.

B. When the complete VFD is provided as a part of the equipment, the VDF shall be tested by the equipment manufacturer. The VFD shall drive a motor connected to a dynamometer at full load and speed and shall be cycled during the automated test procedure. All optional features shall be functionally tested at the factory for proper operation.

PART 3 - EXECUTION

3.1 Start-up Service

A. The manufacturer shall provide start-up of the VFD and its optional circuits by a factory certified service technician who is experienced in start-up and repair services.

B. Sales personnel and other agents who are not factory certified shall not be acceptable as commissioning agents.

C. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system.

D. Harmonic filtering.

1. The VFD supplier shall, with the aid of the buyer’s detailed electrical power single line diagram showing all impedances in the power path to the VFDs, perform an analysis to initially demonstrate the supplied equipment will met the IEEE recommendations after installation.

2. If, as a result of the analysis, it is determined that additional filter equipment is required to meet the IEEE recommendations, then the cost of such equipment shall be included in the drive supplier quotation.

END OF SECTION 230901

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.
2. Concrete-encased conduit, ducts, and duct accessories.
3. Handholes and boxes.
4. Manholes.

1.3 DEFINITIONS

A. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including separators and miscellaneous components.
2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for manholes, handholes, and boxes.
4. Include warning tape.

B. Shop Drawings:

1. Precast manholes and handholes:

a. Include plans, elevations, sections, details, attachments to other work, and accessories.
b. Include duct entry provisions, including locations and duct sizes.
c. Include reinforcement details.
d. Include frame and cover design and manhole frame support rings.
e. Include Step details.
f. Include grounding details.
g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
h. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

    a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
    b. Include duct entry provisions, including locations and duct sizes.
    c. Include cover design.
    d. Include grounding details.
    e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

A. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

B. Product Certificates: For concrete and steel used in precast concrete manholes and handholes, as required by ASTM C 858.

C. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

D. Source quality-control reports.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.7 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Engineer no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Engineer written permission.

B. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted in the contract documents.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

A. Comply with ANSI C2.

2.2 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ARNCO Corp.
2. Beck Manufacturing.
3. Cantex, Inc.
4. CertainTeed Corporation.
5. Condux International, Inc.
6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX Inc.
9. Lamson & Sessions; Carlon Electrical Products.
10. Spiraduct/AFC Cable Systems, Inc.
11. or Approved Equal.

B. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-80 (only when specifically called out on the drawings) and Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.

C. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.4 PRECAST CONCRETE HANDHOLES AND BOXES (All Handholes and Boxes larger than 4 sq. ft. shall be precast)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Christy Concrete Products.

2. Elmhurst-Chicago Stone Co.
3. Oldcastle Precast Group.
4. Rinker Group, Ltd.
5. Riverton Concrete Products.
6. Utility Concrete Products, LLC.
7. Utility Vault Co.
8. Wausau Tile Inc.
9. or Approved Equal

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Top of handhole to be located at finished grade (handhole cover shall be traffic rated).

D. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
1. Frame and Cover: Galvanized steel frame, with hinged galvanized steel access door assembly with tamper-resistant, captive, cover-securing bolts.

    a. Cover Hinges: Concealed, with hold-open ratchet assembly.
    b. Cover Handle: Recessed.

2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
3. Cover Legend: Molded lettering, as required to identify system indicated on the drawings.
4. Configuration: Units shall be designed for raised burial and have open bottom unless otherwise indicated. (Install handholes on a minimum of 12” of clean crushed stone.)
5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

    a. Extension shall provide increased depth of 12 inches (300 mm).
    b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.

6. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
7. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.

    a. Windows shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
    b. Window opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
    c. Window openings shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.

8. Handholes shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE (for area less than 4 sq. ft.)

A. General Requirements for Handholes and Boxes: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated. (Install on 12” of clean crushed stone)
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, as required to identify system indicated on the drawing.
6. All conduits shall enter the handholes and other boxes from the bottom. All 90 degree bends shall be long radius.

B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two. Boxes shall be rated for Tier 22 or Tier 15 based on location.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. NewBasis.
d. Quazite: Hubbell Power System, Inc.
e. or Approved Equal.

2.6 PRECAST MANHOLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Christy Concrete Products.
2. Elmhurst-Chicago Stone Co.
3. Oldcastle Precast Group.
4. Rinker Group, Ltd.
5. Riverton Concrete Products.
6. Utility Concrete Products, LLC.
7. Utility Vault Co.
8. Wausau Tile Inc.
9. or Approved Equal

B. Comply with ASTM C 858.

C. Precast Manholes: One-piece units and units with interlocking mating sections, complete with accessories, hardware, and features.

D. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.

1. Windows shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or roofs of manholes, but close enough to corners to facilitate racking of cables on walls.
2. Window opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
3. Window openings shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.

E. Concrete Knockout Panels: 1-1/2 to 2 inches (38 to 50 mm) thick, for future conduit entrance and sleeve for ground rod.

F. Ground Rod Sleeve: Provide a 3-inch (75-mm) PVC conduit sleeve in manhole floors 2 inches (50 mm) from the wall adjacent to, but not underneath, the ducts routed from the facility.

G. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

H. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.

1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A 48/A 48M, Class 30B with milled cover-to-frame bearing surfaces; diameter, 29 inches (725 mm).

   a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
   b. Special Covers: Recess in face of cover designed to accept finish material in paved areas.

2. Cover Legend: Cast in. Selected to suit system.

   a. Legend: "ELECTRIC-LV" for duct systems with power wires and cables for systems operating at 600 V and less.
   b. Legend: "ELECTRIC-HV" for duct systems with medium-voltage cables.

3. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.

   a. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. (60 L) where packaged mix complying with ASTM C 387, Type M, may be used.

I. Manhole Sump Frame and Grate: ASTM A 48/A 48M, Class 30B, gray cast iron.

J. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch- (50-mm-) diameter eye, and 1-by-4-inch (25-by-100-mm) bolt.

1. Working Load Embedded in 6-Inch (150-mm), 4000-psi (27.6-MPa) Concrete: 13,000-lbf (58-kN) minimum tension.

K. Pulling-In and Lifting Irons in Concrete Floors: 7/8-inch- (22-mm-) diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.

1. Ultimate Yield Strength: 40,000-lbf (180-kN) shear and 60,000-lbf (270-kN) tension.

L. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch (13-mm) bolt, 5300-lbf (24-kN) rated pullout strength, and minimum 6800-lbf (30-kN) rated shear strength.

M. Cable Rack Assembly: hot-dip galvanized, except insulators.

1. Stanchions: T-section or channel; 2-1/4-inch (56-mm) nominal size; punched with 14 holes on 1-1/2-inch (38-mm) centers for cable-arm attachment.
2. Arms: 1-1/2 inches (38 mm) wide, lengths ranging from 3 inches (75 mm) with 450-lb (204-kg) minimum capacity to 18 inches (450 mm) with 250-lb (114-kg) minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.
3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.

N. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F (2 deg C). Capable of withstanding temperature of 300 deg F (150 deg C) without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

O. Cover Hooks: Heavy duty, designed for lifts 60 lbf (270 N) and greater, Two required.

2.7 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
1. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
2. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Engineer if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

3.2 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Cables More than 600 V: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40 -PVC, in concrete-encased duct bank unless otherwise indicated.

C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

D. Underground Ducts Crossing Roadways and Paved Areas : RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 or Polymer concrete, SCTE 77, Tier 22 structural load rating.
3. Units in Sidewalk, Similar Applications, and Non Paved Areas with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 or Polymer concrete units, SCTE 77, Tier 15

B. Manholes: Precast concrete.

1. H-20 structural load rating according to AASHTO HB 17.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with the provisions of the contract documents and the manufacturer’s recommendations. Compact gravel under manholes and handholes to 95% modified proctor.
1. Provide 12” of crushed stone for placement of all manholes and handholes

B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Cut and patch existing pavement in the path of underground ducts and utility structures according to the general provisions of the contract. ."

3.5 DUCT INSTALLATION

A. Install ducts according to NEMA TCB 2.

B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.

C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1200 mm), both horizontally and vertically, at other locations unless otherwise indicated.

D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

E. Installation Adjacent to High-Temperature Steam Lines: Where duct banks are installed parallel to underground steam lines, perform calculations showing the duct bank will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.

F. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches (250 mm) o.c. for 5-inch (125-mm) ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch (19 mm).
3. Grout end bells into structure walls from both sides to provide watertight entrances.

G. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

H. Building Conduit Entry Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

I. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in empty ducts.

J. Concrete-Encased Ducts: Support ducts on duct separators.

1. Excavate trench bottom to provide firm and uniform support for duct bank.
2. Width: Excavate trench 12 inches (300 mm) wider than duct bank on each side.
3. Depth: Install top of duct bank at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (750 mm) below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
4. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
5. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches (150 mm) between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
6. Minimum Space between Ducts: 3 inches (75 mm) between ducts and exterior envelope wall, 2 inches (50 mm) between ducts for like services, and 4 inches (100 mm) between power and signal ducts.

7. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of base. Install insulated grounding bushings on terminations at equipment.

8. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
9. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
10. Concrete Cover: Install a minimum of 3 inches (75 mm) of concrete cover at top and bottom, and a minimum of 2 inches (50 mm) on each side of duct bank.
11. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

    a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
    b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch (15-mm) reinforcing-rod dowels extending a minimum of 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.

12. Pouring Concrete: Comply with requirements in accordance with the general conditions of the contract. Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

K. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches (150 mm) between tiers.
4. Depth: Install top of duct bank at least 24” below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Install ducts with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and signal ducts.
7. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

8. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches (100 mm) over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply to 95% modified Proctor.

a. Place minimum 3 inches (75 mm) of sand as a bed for duct bank. Place sand to a minimum of 6 inches (150 mm) above top level of duct bank.

L. Warning Tape: Bury warning tape approximately 12 inches (300 mm) above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Manhole Roof: Install with rooftop at least 15 inches (375 mm) below finished grade.
2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch (25 mm) above finished grade.
3. Install handholes with bottom below frost line.
4. Traffic Rated Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
5. Install precast handholes without traffic rated lids 6” above grade.
6. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

D. Manhole Access: Circular opening in manhole roof; sized to match cover size.

1. Install chimney, constructed of precast concrete collars and rings, to support cast-iron frame to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for frame to chimney.

E. Waterproofing: Apply waterproofing to exterior surfaces of manholes and precast concrete handholes after concrete has cured at least three days. After ducts have been connected and grouted, and before backfilling, waterproof joints and connections, and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

F. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.

G. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches (97 mm) for manholes and 2 inches (50 mm) for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.

D. Install handholes and boxes with bottom below frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

F. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

G. For enclosures subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with the provisions of the general contract. Finish with a trowel. .
2. Dimensions: in accordance with the manufacturer’s recommendations but no less than 10 inches wide by 12 inches deep.

3.8 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Install a 10’ x ¾” copper clad steel ground rod in each manhole and handhole. Bond ground rod to grounding electrode in duct bank or duct counterpoise if provided. Bond ground rod to all metal parts inside the manhole or handhole.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch- (150-mm-) long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.10 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 260543

9/27/2023

Facility Info

Facility Name	0579-135 W. Hanover Street
Facility Address	135 W HANOVER ST
	TRENTON NJ 08618
	001
Description	

Degree Day Information

Weather Station Location	INTERNATIONAL AIRPORT - PHILADELPHIA, PA
Weather Station ID	13739

Facility Personnel Info

Name	First Name	Phone Number	Email	Title

Utility Vendor Information

VendorName	Vendor Type	Vendor Duns Number	Contact Person Name	Contact Phone Number	Contact Email	Contact Fax Number	Contact Address
PUBLIC SERVICE ELECTRIC AND GAS CO.	BOTH (ESP & LDC)	[redacted]	Craig Smith	(609) 780-6859	craig.smith@pseg.com		PO BOX 14444 NEW BRUNSWICK NJ 08906 4444
PUBLIC SERVICE ELECTRIC AND GAS CO.	LDC - LOCAL DISTRIBUTION COMPANY	[redacted]	Craig Smith	(609) 780-6859	craig.smith@pseg.com		PO BOX 14444 NEW BRUNSWICK NJ 08906 4444
TRENTON WATER WORKS	BOTH (ESP & LDC)						PO BOX 70226 Philadelphia PA 19176 0226
DIRECT ENERGY BUSINESS (70220)	ESP - ENERGY SERVICE PROVIDER						PO Box 70220 Philadelphia PA 19176 0220
NRG Business Marketing (32179)	ESP - ENERGY SERVICE PROVIDER						P.O. Box 32179 NEW YORK NY 10087 2179

Sheet List

Dwg. No. | Sheet No. | Sheet Name

GENERAL
01 T001 Title Sheet
02 G001 Drawing Index

CIVIL
03 C101 Parking Lot Restoration Plan & Details
04 C102 Lighting Plan
05 C103 Photometric Lighting Plan
06 C104 Lighting Details
07 C105 Lighting Details
08 C106 Lighting Details

STRUCTURAL
09 S000 Cover Sheet
10 S001 General Notes & Abbreviations
11 S100 Basement Plan
12 S101 First Floor Framing Plan
13 S102 Second Floor Framing Plan
14 S103 Third Floor Framing Plan
15 S104 Fourth Floor Framing Plan
16 S105 Roof Floor Framing Plan
17 S200 Typical Details

ARCHITECTURAL
18 AG001 Notes, Symbols, & Abbreviations
19 D100 Basement & First Floor Level Demolition Plan
20 D101 Second & Third Floor Level Demolition Plan
21 D102 Fourth Floor Level, Roof, & Penthouse Demolition Plan
22 D103 Enlarged Exterior Entrance Stair Demolition Plan
23 D104 Enlarged Exterior Ramp and Stair Demolition Plan
24 D401 Demolition Reflected Ceiling Plan - First Floor
25 D402 Demolition Reflected Ceiling Plan - Second Floor
26 D403 Demolition Reflected Ceiling Plan - Third Floor
27 D404 Demolition Reflected Ceiling Plan - Fourth Floor
28 LS100 Life Safety Plans I
29 LS101 Life Safety Plans II
30 LS102 Life Safety Plans III
31 SW100 Architectural Site Plan
32 A001 General Details & Partition Types
33 A002 General Details
34 A003 Window & Louver Details
35 A004 Door Schedule & Details
36 A005 Firestop Penetration Details
37 A006 Firestop Penetration Details
38 A007 Firestop Penetration Details
39 A008 Typ. Accessibility Details
40 A100 Basement Floor Level Overall Plan
41 A101 First Floor Level Overall Plan
42 A102 Second Floor Level Overall Plan
43 A103 Third Floor Level Overall Plan
44 A104 Fourth Floor Level Overall Plan
45 A105 Penthouse & Roof Level Overall Plan
46 A106 Fireproofing Plan for Structural Framing
47 A107 Fireproofing Plan for Structural Framing
48 A108 Fireproofing Plan for Structural Framing
49 A110 Basement Floor Part Plan I
50 A111 Basement Floor Part Plan II
51 A112 First Floor Level Part Plan I
52 A113 First Floor Level Part Plan II
53 A114 Second Floor Level Part Plan I
54 A115 Second Floor Level Part Plan II
55 A116 Third Floor Level Part Plan I
56 A117 Third Floor Level Part Plan II
57 A118 Fourth Floor Level Part Plan I
58 A119 Fourth Floor Level Part Plan II
59 A200 Elevations I
60 A201 Elevations II
61 A202 Elevations III
62 A203 Elevations IV
63 A204 Elevations V
64 A300 Overall Building Section I
65 A301 Overall Building Section II
66 A302 Overall Building Section III
67 A303 Overall Building Section IV
68 A400 Basement Level Reflected Ceiling Plan
69 A401 First Floor Level Reflected Ceiling Plan
70 A402 Second Floor Level Reflected Ceiling Plan
71 A403 Third Floor Level Reflected Ceiling Plan
72 A404 Fourth Floor Level Reflected Ceiling Plan
73 A500 Typical Enlarged Men's Toilet Room Plan & Elevations
74 A501 Typical Enlarged Women's Toilet Room Plan & Elevations
75 A502 Typical Enlarged Toilet Rooms Plan & Elevations
76 A503 Enlarged Pantry & Fourth Level Toilet Room Plans & Elevations
77 A504 Enlarged Pantry Plans, Elevations & Sections
78 A505 Typical Stair Plan & Elevations
79 A506 Typical Stair Plan & Elevations
80 A507 Enlarged Plan & Sections - Security Desk
81 A508 Enlarged Exterior Stair Plan & Section
82 A509 Enlarged Exterior Ramp & Stair Plan
83 A600 Wall Sections
84 A601 Wall Sections II
85 A700 Plan Details I
86 A703 Section Details I
87 A704 Section Details II
88 A705 Section Details III
89 A706 Section Details IV
90 A711 Roof Details
91 A721 Railing Details
92 A722 Railing Details II
93 A800 Basement Floor Level Finish Plan
94 A801 First Floor Level Finish Plan
95 A802 Second Floor Level Finish Plan
96 A803 Third Floor Level Finish Plan
97 A804 Fourth Floor Level Finish Plan
98 A805 Finish Details
99 A900 Basement & First Floor Level Signage Plans
100 A901 Second & Third Floor Level Signage Plans
101 A902 Fourth Floor Level Signage Plan
102 A903 Signage Schedule
103 A904 Signage Schedule 2

Sheet List

Dwg. No. | Sheet No. | Sheet Name

FIRE PROTECTION
104 FP001 Fire Protection Notes, Symbols, Abbreviations
105 FP101 Fire Protection Basement Plan - Demolition
106 FP102 Fire Protection First Floor Plan - Demolilition
107 FP103 Fire Protection Second Floor Plan - Demolition
108 FP104 Fire Protection Third Floor Plan - Demolition
109 FP105 Fire Protection Fourth Floor Plan - Demolition
110 FP106 Fire Protection Penthouse Plan - Demolition
111 FP201 Fire Protection Basement Plan - Installation
112 FP202 Fire Protection First Floor Plan - Installation
113 FP203 Fire Protection Second Floor Plan - Installation
114 FP204 Fire Protection Third Floor Plan - Installation
115 FP205 Fire Protection Fourth Floor Plan - Installation
116 FP206 Fire Protection Penthouse Plan - Installation
117 FP501 Fire Protection Details
118 FP601 Fire Protection Riser Diagrams

PLUMBING
119 PL001 Plumbing - Notes, Symbols, And Abbreviations
120 PL101 Sanitary Demolition - Basement Underslab Plan
121 PL102 Plumbing - Basement Underslab
122 PL103 Plumbing - Basement Floor Plan
123 PL104 Plumbing - First Floor Plan
124 PL105 Plumbing - Second Floor Plan
125 PL106 Plumbing - Third Floor Plan
126 PL107 Plumbing - Fourth Floor Plan
127 PL401 Sanitary - Enlarged Part Plans - Sheet 1
128 PL402 Sanitary - Enlarged Part Plans - Sheet 2
129 PL403 Domestic Water - Enlarged Part Plans - Sheet 1
130 PL404 Domestic Water - Enlarged Part Plans - Sheet 2
131 PL501 Plumbing - Details
132 PL601 Plumbing - Riser Diagrams - Sheet 1
133 PL602 Plumbing - Riser Diagrams - Sheet 2
134 PL603 Plumbing - Riser Diagrams - Sheet 3
135 PL701 Plumbing - Schedules

MECHANICAL
136 M001 Mechanical Legend, Abbreviations, and Notes
137 M100 Mechanical Ductwork Basement Plan - North
138 M101 Mechanical Ductwork Basement Plan - South
139 M102 Mechanical Ductwork 1st Floor Plan - North
140 M103 Mechanical Ductwork 1st Floor Plan - South
141 M104 Mechanical Ductwork 2nd Floor Plan - North
142 M105 Mechanical Ductwork 2nd Floor Plan - South
143 M106 Mechanical Ductwork 3rd Floor Plan - North
144 M107 Mechanical Ductwork 3rd Floor Plan - South
145 M108 Mechanical Ductwork 4th Floor Plan - North
146 M109 Mechanical Ductwork 4th Floor Plan - South
147 M110 Mechanical Ductwork Roof Plan - North
148 M111 Mechanical Ductwork Roof Plan - South
149 M200 Mechanical Piping Basement Plan - North
150 M201 Mechanical Piping Basement Plan - South
151 M202 Mechanical Piping 1st Floor Plan - North
152 M203 Mechanical Piping 1st Floor Plan - South
153 M204 Mechanical Piping 2nd Floor Plan - North
154 M205 Mechanical Piping 2nd Floor Plan - South
155 M206 Mechanical Piping 3rd Floor Plan - North
156 M207 Mechanical Piping 3rd Floor Plan - South
157 M208 Mechanical Piping 4th Floor Plan - North
158 M209 Mechanical Piping 4th Floor Plan - South
159 M210 Mechanical Piping Roof Plan - North
160 M211 Mechanical Piping Roof Plan - South
161 M400 Control Notes, Legend & BAS System Diagram
162 M401 Control Diagram & Sequence of Operation - Sheet 1 of 4
163 M402 Control Diagram & Sequence of Operation - Sheet 2 of 4
164 M403 Control Diagram & Sequence of Operation - Sheet 3 of 4
165 M404 Control Diagram & Sequence of Operation - Sheet 4 of 4
166 M500 Mechanical Details Sheet 1 of 5
167 M501 Mechanical Details Sheet 2 of 5
168 M502 Mechanical Details Sheet 3 of 5
169 M503 Mechanical Details Sheet 4 of 5
170 M504 Mechanical Details Sheet 5 of 5
171 M600 Air System Diagram
172 M700 Mechanical Schedules Sheet 1 of 3
173 M701 Mechanical Schedules Sheet 2 of 3
174 M702 Mechanical Schedules Sheet 3 of 3
175 MD100 Mechanical Basement Demolition Plan
176 MD101 Mechanicanl Roof Demolition Plan

Sheet List

Dwg. No. | Sheet No. | Sheet Name

ELECTRICAL
177 E001 Electrical General Notes, Symbols, and Abbreviations
178 E101 Electrical Power Plan - Site
179 E102 Electrical Power Plan - Basement
180 E103 Electrical Power Plan - First Floor
181 E104 Electrical Power Plan - Second Floor
182 E105 Electrical Power Plan - Third Floor
183 E106 Electrical Power Plan - Fourth Floor
184 E107 Electrical Power Plan - Roof
185 E108 Electrical Reflected Ceiling Plan - Basement
186 E109 Electrical Reflected Ceiling Plan - First Floor
187 E110 Electrical Reflected Ceiling Plan - Second Floor
188 E111 Electrical Reflected Ceiling Plan - Third Floor
189 E112 Electrical Reflected Ceiling Plan - Fourth Floor
190 E113 Electrical Mechanical Power Plan - Basement
191 E114 Electrical Mechanical Power Plan - First Floor
192 E115 Electrical Mechanical Power Plan - Second Floor
193 E116 Electrical Mechanical Power Plan - Third Floor
194 E117 Electrical Mechanical Power Plan - Fourth Floor
195 E118 Electrical Lightning Plan - Roof
196 E301 Electrical Enlarged Plans
197 E501 Electrical Details
198 E502 Electrical Details
199 E503 Lighting Details
200 E504 Lighting Details
201 E601 Electrical Single Line Diagram
202 E602 Grounding Riser Diagram
203 E603 Panel Schedules
204 E604 Panel Schedules
205 E605 Panel Schedules
206 E606 Panel Schedules
207 E607 Panel Schedules
208 E608 Panel Schedules
209 E609 Panel Schedules
210 E610 Panel Schedules
211 E611 Panel Schedules
212 E612 Panel Schedules
213 E613 Panel Schedules
214 E614 Panel Schedules
215 E615 Lighting Schedules
216 E616 Mechanical Schedules
217 E617 Cable Schedule
218 E618 Conduit Schedule
219 E619 Conduit Schedule
220 ED101 Electrical Demolition Power Plan - Basement
221 ED601 Electrical Demolition Single Line Diagram
222 FA001 Fire Alarm Lead Sheet
223 FA101 Fire Alarm Plan - Basement
224 FA102 Fire Alarm Plan - First Floor
225 FA103 Fire Alarm Plan - Second Floor
226 FA104 Fire Alarm Plan - Third Floor
227 FA105 Fire Alarm Plan - Fourth Floor
228 FA106 Fire Alarm Plan - Penthouse
229 FA501 Fire Alarm System Details 1 of 2
230 FA502 Fire Alarm System Details 2 of 2
231 FA601 Fire Alarm Riser Diagram

COMMUNICATION SYSTEMS
232 CS100 Communications Systems - General Notes, Symbols, and Abbreviations
233 CS101 Communications System Plan - Basement
234 CS102 Communications System Plan - First Floor
235 CS103 Communications System Plan - Second Floor
236 CS104 Communications Sytem Plan - Third Floor
237 CS105 Communications System Plan - Fourth Floor
238 CS106 Communications System Plan - Roof and Penthouse Level
239 CS500 Communications System - Network Rack Layout & Details - Basement
240 CS501 Communications System - Network Rack Layout & Details - First Floor
241 CS502 Communications System - Network Rack Layout & Details - Second Floor
242 CS503 Communications System - Network Rack Layout & Details - Third Floor
243 CS504 Communications System - Network Rack Layout & Details - Fourth Floor
244 CS600 Communication System - Telecommunication Riser Diagram
245 CS601 Communication System - ACS & CCTV System Riser Diagram
246 CS602 Communication System - Intrusion Detection System Riser Diagram
247 CS603 Communication System - Access Control Panel Layout & Details
248 CS604 Communication System - Access Control Panel Typical Wiring Diagram
249 CS605 Communication System - Access Control System Typical Installation Details
250 CS606 Communication System - CCTV System Details
251 CS607 Video Intercom System Details
252 CS608 Intrusion Detection System Details
253 CS609 Communication System Installation Details
254 CS610 Rack Power Distribution Wiring Diagram 1 of 2
255 CS611 Rack Power Distribution Wiring Diagram 2 of 2
256 CS612 Fiber Optic Wiring Diagram
257 CS613 Audio Video System Diagram

VERTICAL TRANSPORTATION
258 VT001 Abbreviations and General Notes
259 VT002 Tech Data
260 VT101 Existing Pit and Hoistway Plans
261 VT102 Existing Controller and Machine Rooms
262 VT103 Existing Section Thru Hoistway
263 VT201 Proposed Pit and Hoistway Plans
264 VT202 Proposed Controller and Machine Rooms
265 VT203 Proposed Section Thru Hoistway
266 VT204 Proposed Cab Plan and Sections

4

NJDCA STAMP CLEAR SPACE

State Office Building Interior Renovation & Upgrades

Location
135 W Hanover St. Trenton, New Jersey

Project Number
DPMC: A1349-00
L+G: 21567

Date
08.10.2023

Architect
LAMMEY + GIORGIO
Lammey + Giorgio Architecture + Design
215 Highland Ave, Suite B
Haddon Twp, NJ, 08108
p.856.833.0010

William Lammey - AIA - NJ C6793
Anthony Giorgio - AIA - NJ 07626

Client
NJ Division of Property Management & Construction
Trenton, NJ 08608

MEPFP Engineer
MOTT MACDONALD
Mott MacDonald
111 Wood Ave South
Iselin, NJ 08830-4112
p.609.465.9377

Structural Engineer
O'Donnell & Naccarato
701 Market Street Suite 6000
Philadelphia, PA 19106
p.800.607.7284

Vertical Transport Engineer
Vertical Transportation Excellence
5 Eves Drive, Suite 200
Marlton, NJ 08053
p.800.830.4668

#	Issue/Revision	Date
1	FINAL DESIGN I	10/13/2022
2	FINAL DESIGN 2	01/16/2023
3	FINAL DESIGN 3	08/10/2023
4	BULLETIN A	09/26/2023

Sheet Title
Drawing Index

Sheet No.
G001
Sheet 02 of xx

©Lammey + Giorgio 2022