

ADVERTISEMENT FOR BIDS

Project No: P1107-02 – Equipment Pre-Purchase
Location: Central Railroad of New Jersey (CRRNJ) Terminal Building
Liberty State Park, Jersey City, Hudson County, NJ

A NON-MANDATORY PRE-BID MEETING IS SCHEDULED FOR 11:00 A.M., OCTOBER 8, 2014. LOCATION: CRRNJ TERMINAL BUILDING, LIBERTY STATE PARK, 1 AUDREY ZAPP DRIVE, JERSEY CITY, NJ. CONTACT PERSON: BILL BYSTER (609) 433-2001.

IT IS HIGHLY RECOMMENDED CONTRACTORS ATTEND THIS NON-MANDATORY PRE-BID MEETING.

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 October 21, 2014 for:

Single Bid (lump sum)
Equipment Supplier or
HVAC Contractor or
Electrical Contractor
\$2,822,685.54

Bid Documents may be examined at the above address or obtained for a document fee based on the individual trade estimate shown above, as follows: Trade Estimate up to \$100,000 – No Fee, in excess of \$100,000 - \$65.00. An additional \$25.00 fee is required for mailing of bid documents. 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 **Catherine Douglass at (609) 777-3094** 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 Street, 9th Floor, Trenton, NJ 08608).

BID SECURITY IS WAIVED FOR THIS PROJECT.

No bidder may withdraw his bid for 60 calendar days after the opening. The State may reject any and all bids.

Bidders are required to comply with the requirements of P.L. 1975, c. 127, N.J. Law Against Discrimination.

Notice of Executive Order 125 Requirement for Posting of Winning Proposal and Contract Documents

Pursuant to Executive Order No. 125, signed by Governor Christie on February 8, 2013, the Office of the State Comptroller (“OSC”) is required to make all approved State contracts for the allocation and expenditure of federal reconstruction resources available to the public by posting such contracts on an appropriate State website. Such contracts are posted on the New Jersey Sandy Transparency website located at:

<http://nj.gov/comptroller/sandytransparency/contracts/sandy/>.

The contract resulting from this RFQ/RFP is subject to the requirements of Executive Order No. 125. Accordingly, the OSC will post a copy of the contract, including the RFQ/RFP, the winning bidder’s proposal and other related contract documents for the above contract on the Sandy Transparency website.

In submitting its proposal, a bidder may designate specific information as not subject to disclosure. However, such bidder must have a good faith legal and/ 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.

The State reserves the right to make the determination as to 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, confidential and/or to claim copyright protection for its 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.

RICHARD M. FERRARA, 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

REQUEST FOR PROPOSAL

EQUIPMENT PRE-PURCHASE

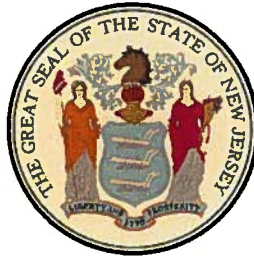
Central Railroad of New Jersey Terminal Building
Jersey City, Hudson County, N.J.

DPMC PROJECT #P1107-02

STATE OF NEW JERSEY

Honorable Chris Christie, Governor

Honorable Kim Guadagno, Lieutenant Governor



DEPARTMENT OF THE TREASURY

Andrew P. Sidamon-Eristoff, State Treasurer

DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION

Steven Sutkin, Director

STV Architects, Inc.

820 Bear Tavern Road, Suite 200, Trenton, NJ 08628-1021

Date: August 15, 2014

STATE OF NEW JERSEY
DEPARTMENT OF TREASURY
DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION
PO BOX 034, TRENTON, NJ 08625-0034

PROJECT #: P1107-02
Equipment Pre-purchase
Central Railroad of New Jersey Terminal Building
Jersey City, Hudson County, NJ

A/E: STV Architects, Inc.

DATE: October 08, 2014

BULLETIN “B”

Bidder must acknowledge receipt of this Bulletin on bid form in the space provided therefore.

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.

1. Correction to Post-bid Review meeting location:

- GENERAL STATEMENT 1.1.D - **Mandatory** Post-bid Review Meeting will be held at 10:00AM on 10/21/14 at DPMC – Office of Design & Construction, 20 West State Street, 2nd Floor Conference Room 218, Trenton, NJ 08625.

2. The following are **“Revisions and Corrections”** to the technical specification and other issued bid documents:

- All bids shall include manufacturer standard warranties for the proposed products, equipment, components or systems. All references to extended or special warranties are hereby omitted from the bid documents. No extended or special warranties are required.
- Section 213213. Page 5. Part 2.05-B
 - The aboveground concrete water storage tank is **not** part of this contract and will be provided by others. It is mentioned for reference only
- Section 260503, page 3, paragraph 1.05
 - All listed submittal requirements are due within 24 hours of the bid opening, not with the bid as stated in the above referenced paragraph
- Section 260573, page 1, paragraph 2.01.A
 - Delete the above reference paragraph in its entirety

- All Mechanical Specification shall be modified as follows:

FIELD QUALITY CONTROL:

- The first sentence shall be deleted and replaced with “The manufacturer shall provide support to the installing contractor for performance of all required field testing.”
 - All references to minimum duration required for the field support shall remain unchanged and as specified in each section
- The payment schedule is hereby revised as follows:
 1. 25% at Completion of Approved submittals
 2. 25% at Manufacturing Completion
 3. 40% at Delivery of equipment to site
 4. 5% at Completion of manufacturer’s field support to the General Construction Contractor for the Installation project by a manufacturer’s representative as required for installation and integration of system
 5. 5% at receipt of O&M manuals, training and any documents required for the C of A and / or to close out the project

3. The following are response to questions submitted by **Claremont Construction Group:**

Question #1: In specification Section 236423-3 “Scroll Water Chillers” under Para. 1.10 “Warranty”, it indicates an “add alternate of 5 year all parts/labor warranty from date of substantial complete.” There is no ADD ALTERNATE in the bid proposal. Is this part of the bid proposal?

Response: See “Revisions & Corrections” above

Question #2: Under varies specification Sections under Warranty, it indicates additional cost “to extend the warranty to 5 years from the date of substantial completion.” Are these requirements for the Bid Proposal? These Sections are as follows:

- Section 213113 “Electrical Driven Vertical Turbine Fire Pumps With Pre-Fabricated Pump House”
- Section 232123 “Hydronic Pumps”
- Section 235216 “Condensing Boilers”
- Section 235700 “Heat Exchangers For HVAC”
- Section 260503 “Electrical Pre-purchase General”
- Section 260573 “Overcurrent Protective Device Coordination Study and Arc-Flash Study”
- Section 262413 “Service Switchboard”
- Section 263213.13 “Diesel Engine-Driven Generator Set”
- Section 263623 “Automatic Transfer Switches”

Response: see “Revisions & Corrections” above

Question #3: In Section 213213-9 & 11, Para. 2.07.J requires a Roof Hatch. Para. 2.07.W.5 “(1) Overhead automatic system with flow sensor per NFPA 13.” Are these part of this Bid? Or are these items part of the future installation Bid?

Response: These items are part of this bid

Question #4: In the General Statement Para. 1.3.D “Specification Explanation”, it indicates “The “Contractor” shall comply with all provisions of parts 1 and 2 of the technical specification.” Are the following applicable to this Bid Proposal? Or part of the future installation Bid?

- Section 213213-12, Para. 2.09.A,B,C,D,F &M “Installation”

Response: These items are part of this bid

- Section 263213.13-22, Para. 2.11.B. “Provide a remote annunciator, located in the Building Engineer’s Office”. Is this supplying to the future installation Bid?

Response: The Remote Annunciator shall be supplied by others as part of the equipment installation project

Question #5: Is there retainage being held for this Project?

Response: There will be no retainage on this contract

Question #6: Can the equipment for this Bid be stored in different off-site storage facilities?

Response: Yes

Question #7: DPMC Standard Terms & Conditions Article 1.9. What Code Permits are required for this Bid?

Response: There will be no code permits’ requirement in this contract

Question #8: In Section 260503-3, Para. 1.05.A “Manufacturer’s Proposal”, it states, “The information submitted with the bid shall include, but not limited to the following items:” This includes technical proposal, schedule, lead times, shop drawings, physical layout of the allocated space (there are no construction drawings issued), etc. This is not included in the Bid Proposal for this Project.

Response: Yes, this is not part of this bid. Submit all data and drawings for equipment only. Installation of equipment to be completed by others

Question #9: In Section 260503-2 Para.1.03.G, notes to provide documentation of all equipment proposed “has been used in successful operation for a period of less than five (5) years.” Since the documents list specified manufacturers, hasn’t the Engineer done this research? Otherwise, why is this required?

Response: If the bids are based on the basis-of-design manufacturers & products, this stipulation can be waived. This manufacturer prequalification will be required for ‘or equals’

Question #10: Throughout the specifications, it indicates minimum specific time frames in man days or weeks for “Field Quality Control”. Since this is advertised as a Single Lump Sum bid, the bidder for this Project is responsible for complying with the Field Quality control not the specific time frames noted in the specifications. Is this correct?

Response: Manufacturer field support is part of this package & shall be included in the bids. The number of days and/or hours indicated in the bid documents are estimates of the required effort. It may vary based on the proposed manufacturer & product. The manufacturer field support shall be as required to support equipment installation by the G.C.

4. The following are response to additional questions submitted by Claremont Construction Group:

Question #1: Are the manufacturers' representatives subject to prevailing wage, since the work is not listed in the trade classifications.

Response: No, they are not subject to prevailing wages

Question #2: Under specification Section 213213-5, Para. 2.05.B "Vertical Turbine Fire Pump", is the aboveground 22,500 gallons concrete water supply tank in the future installation Project bid?

Response: As stated above in item #2, "Revisions & Corrections", the aboveground concrete water storage tank is not part of this contract and will be provided by others. It is mentioned for reference only

Question #3: Under Section 260573-2, Para. 2.02.A.B.C "General" states that the following is part of this Bid, "short circuit/arc flash/overcurrent protection/coordination study". Should this requirement be part of the future installation Project bid?

Response: No, the study shall be provided as part of this bid. It is considered part of manufacturer's field support to the General Construction Contractor for the Installation project as required for installation and integration of system.

Question #4: Under Section 263213.13 "Diesel Engine-Driven Generator Set", Para.1.04.A.5 "Submittal", is the PE stamped calculations by NJ registered Engineer an absolute requirement in the Bid?

Response: Yes

Question #5: If the materials/equipment is stored at the manufacturer's facility, is insurance certificates required?

Response: Yes

Question #6: In the breakdown payment percentages as raised at the Pre-Bid, a very high percentage for Closeout and Commissioning amount to 20% of the bid proposal. This means that this Contractor must wait at least a year before this work can be invoiced. Can these line items be reviewed for a more realistic percentages given the length of time is dependent on the installation Project Contractor?

Response: Yes, see "Revisions & Corrections" above

Question #7: Per the above Question #6, since the Pre-Purchased Equipment will be defined during this Contract, will the State consider moving the commissioning and technical services to the next Project installation bid.

Response: The installation & integration of all building systems are by others. However, factory support (in the form of technical representatives) is required for all pre-purchased equipment, as well as O&M manuals, training and factory support required for balancing reports, calculations, or other documents required to obtain a CofA

5. The following are response to questions submitted by **Gabe Sganga Inc.**,

Question #1: Who is responsible to off load the pre purchased equipment once it is delivered to the job site?

Response: The G.C. will be on board at such time and will be responsible for offloading of equipment. The equipment shall be delivered F.O.B. to the site

Question #2: Spec section scroll water chillers 236423-3, 1.10 warranty, A. 3. Provide as add alternate: 5 year all parts/labor warranty from date of substantial completion. There is no provision for an alternate on the proposal form. Please clarify.

Response: See responses above, all references to extended warranty are eliminated, provide only manufacturer standard warranty

Question #3: Spec section DPMC standard terms & conditions page 3 of 7. Are bid, performance, and maintenance bonds required?

Response: Yes. Bid Bond, Performance Bond and Payment Bond is required. However, Maintenance Bonds are not required.

Question #4: Bulletin A, page 2, 1.03 B application for payment. Once the equipment is delivered to the job site, the vendors will need to be paid in full for the equipment delivered. The current payment break down will not work to pay our vendors. Can you reevaluate the break down for payment? Also can retainage be eliminated for this contract?

Response: please see revised payment schedule above. Portion of the contract amount is slotted for field support, which is separate from equipment cost and will not be delivered until installation of equipment

6. Bid Bonds, Performance and Payment Bonds -

Omit the following from Standard Terms & Conditions: Section 3.3, “Bid and Performance Security” and replace with the following:

1.0 Deposit and Bid Bond

1.1 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.

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

1.3 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.

1.4 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.

2.0 Performance and Payment Bond

2.1 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.

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

2.3 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.

2.4 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.

END OF BULLETIN "B"

STATE OF NEW JERSEY
DEPARTMENT OF TREASURY
DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION
OFFICE OF DESIGN & CONSTRUCTION
PO BOX 034, TRENTON, NJ 08625-0034

PROJECT # P1107-02
Equipment Pre-Purchase
Central Railroad of New Jersey Terminal Building
Jersey City, Hudson County, NJ

A/E: STV Architects, Inc.

DATE: 8/15/14

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.

1.01 SUBMITTALS

A. Submit to Engineer:

1. Submit all required information, using the format requirements provided in the technical specification sections. All bidders are required to fully complete all data sheets and other submittal requirements listed in each section's Appendix Data Sheets and submit as part of the response to this RFP. This data will be used by the engineer for the technical evaluation of the bids, with emphasis on meeting the performance requirements and other criteria of the basis-of-design systems and compatibility with other systems in Divisions 21, 23, and 26 that are part of the package. Missing or incomplete submittal and/or incompatible components will be grounds for rejection of the bid.

B. Engineer's Action:

1. Engineer may request additional information or documentation necessary for evaluation of bids. The Engineer's evaluation as to whether or not a piece of equipment meets these requirements shall be final.

C. Engineer's approval of a product or system during bidding does not relieve the "Contractor" of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

1.02 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of “Contractor’s” procurement schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - 2. Submit the schedule of values to Engineer at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

1.03 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.
 - 1. Initial Application for Payment and final Application for Payment involve additional requirements.
- B. Payment Application Times: The milestone for each progress payment is indicated as follows:
 - 1. 25% at Completion of Approved submittals
 - 2. 25% at Manufacturing Completion
 - 3. 30% at Delivery or Owner’s Acceptance of Storage Option
 - 4. 15% at Startup/Commissioning and submission of close-out documents
 - 5. 5% at Final Project Closeout
- C. Application for Payment Forms: Use forms acceptable to Engineer and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and “Contractor’s” construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet delivered.
 - 1. Provide certificate of insurance, evidence of transfer of title to Owner or Construction Contractor, for stored materials.

2. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

- F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 1. “Contractor’s” procurement schedule (preliminary if not final).
 2. Products list (preliminary if not final).
 3. Submittal schedule (preliminary if not final).

- G. Final Payment Application: After completing Final Project Closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements, including, but not limited to completed manuals and training.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Certified List of Incomplete Items
 4. Updated final statement, accounting for final changes to the Contract Sum.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. All Equipment shall be delivered to the project site F.O.B., no earlier than **3/15/2015** and no later than **3/31/2015**. “Contractor” must notify the Owner and the General Construction Contractor at least 7 days before delivery.

- B. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

- C. Delivery and Handling:
 1. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 2. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

- D. Storage:
 1. **Allowance:** Provide in the lump sum base-bid, a monthly cost for off-site storage for up to six (6) months with the understanding that such storage, if needed, will be used on a month to month basis as per . The use of the monthly off-site storage option will be at the sole discretion of the Owner, and invoiced as a unit cost as directed herein. Failure to list allowance amount on the proposal form will deem the bidder non-responsive.

2. **Unit Price:** Provide the cost of one month of storage as required in the Bid Proposal Form. Failure to list Unit Price amount on the proposal form will deem the bidder non-responsive.

E. Storage Requirements:

1. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
2. Store in the manufacturer's facilities or a Bonded facility agreed to be the State.
3. At the end of the storage period, if exercised by the State, the product shall be shipped and delivered F.O.B. to the project site, at the "Contractor's" expense.

1.05 PRODUCT SUBSTITUTION PROCEDURES AFTER BID AWARD

- A. All systems, components and/or products that are offered in the bids must be based on specific manufacturers and specific product numbers. These must be clearly indicated in the bid documents
- B. Substitution of the specific systems, components and/or other products offered in the bid shall not be permitted after bid award, unless such systems, components and/or products are discontinued by its respective manufacturers
- C. In case a substitution is warranted due to the circumstances described above, the vender shall offer a price adjustment to the State that commensurate with the substitution value. Such price adjustment must be first negotiated with and agreed upon by the State. The substitution must meet all performance requirements and other basis-of-design criteria as described in the technical specification and accepted by the Engineer.

1.06 FINAL COMPLETION CLOSEOUT PROCEDURES

- A. Preliminary Procedures: Before requesting final evaluation for determining final completion and closeout, complete the following:
 1. Submit a final Application for Payment.
 2. Certified List of Incomplete Items: Submit certified copy of Engineer's Completion evaluation list of items to be completed or corrected, endorsed and dated by Engineer. 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.
- B. Evaluation: Submit a written request for final evaluation to determine acceptance. On receipt of request, Engineer will either proceed with evaluation or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after evaluation or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 1. Reevaluation: Request reevaluation when the Work identified in previous evaluations as incomplete is completed or corrected.

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GENERAL STATEMENT

1.1 Special Solicitation Requirements

- A. The term "Contractor" is hereafter used to refer to the party who will be awarded this bid, and with whom the State will contract to provide all products, coordination, shipping, deliveries, storage, certificates, submittals, and all other services described in the bid documents.
- B. This RFP is for the receipt of a single lump sum bid for all items specified in this RFP. The Contractor may, at their option, use suppliers of their choice, or supply the equipment by their own shop or any combination thereof that results in the submission of a fully coordinated system for all of the work herein. Failure to supply all of the equipment / services specified in this RFP will deem the bid unresponsive.
- C. The bidder who submits the lowest responsive bid to this RFP will be required to submit completed the technical data sheets for all of the specified equipment within 24 hours of bid opening. These data sheets are included in the technical sections of this RFP and must be submitted electronically to Emad Asfour at: EMAD.ASFOUR@stvinc.com. Failure to submit these data sheets within the required timeframe may deem the bid non-responsive.
- D. Be advised that a **mandatory** Post-bid Review Meeting will be held at 10:00AM on 10/28/14 at DPMC – Office of Design & Construction, 20 West State Street, 3rd Floor Conference Room North, Trenton, NJ 08625. Contractor must attend the Post-bid Review Meeting with a detailed breakdown of cost estimates for all equipment. Failure to attend this Post-bid Review Meeting with the required breakdown of cost estimates may result in disqualification of "Contractor's" Bid Proposal.

1.2 Scope

- A. This RFP includes furnishing equipment along with start-up, inspection, warranty service, and commissioning activities as required at the CRRNJ Terminal Building, Jersey City, New Jersey. The equipment shall be delivered to the job site ready for installation by the trade contractor.
- B. A warranty is required to be provided for all parts, labor, special tools, refrigerant, and all other aspects required for the equipment to be made properly operational. See technical sections for specific warranty requirements.
- D. The equipment shall be in strict compliance with the latest local, state and federal regulations having authority. The Occupational Safety and Health Administration Hazard Communication Standards must be followed.
- E. Provide equipment and service in compliance with the specifications herein.
- F. The equipment is being pre-purchased by The State of New Jersey. The equipment order will be assigned to a construction trade contractor who will become responsible for all aspects of the equipment procurement and installation the same as if he had originally ordered the equipment, with the supplier coordinating all aspects likewise.

1.3 Specification Explanation

- A. The "Contractor" shall coordinate and organize the entire work specified in all sections of the specifications.**
- B. Wherever the term "provide" is used, it shall mean, "furnish materials, equipment and services complete in all details".**
- C. Where any device or part of equipment is herein referred to in the singular number (such as "the unit") such reference shall be deemed to apply to as many such devices as are required to complete the installation.**
- D. The technical specifications are based on CSI format and include all three (3) parts. The third part of the technical specification titled "Installation" or "Execution" is intended for information and coordination purposes only. The "Contractor" shall comply with all the provisions of parts 1 and 2 of the technical specification.**

"End of General Statement"

DIVISION OF PROPERTY MANAGEMENT & CONSTRUCTION (DPMC)

STANDARD TERMS & CONDITIONS

- I. Unless the bidder is specifically instructed otherwise in the Request for Proposal (RFP), the following terms and conditions will apply to all contracts or purchase agreements made with the State of New Jersey. These terms are in addition to the terms and conditions set forth in the Request for Proposal and should be read in conjunction with same unless the RFP specifically indicates otherwise. If a bidder proposes changes or modifications or takes exception to any of the State's terms and conditions, the bidder must so state specifically in writing in the bid proposal. Any proposed change, modification or exception in the State's terms and conditions by a bidder will be a factor in the determination of an award of a contractor purchase agreement.
- II. All of the State's terms and conditions will become a part of any contract(s) or order(s) awarded as a result of the RFP, whether stated in part, in summary, or by reference. In the event the bidder's terms and conditions conflict with the State's, the State's terms and conditions will prevail, unless the bidder is notified in writing of the State's acceptance of the bidder's terms and conditions.
- III. The statutes, laws or codes cited are available for review at the New Jersey State Library, 185 West State Street, Trenton, New Jersey 08608.
- IV. If awarded a contract or purchase agreement, the bidder's status shall be that of any independent principal and not as an employee of the State.

1. STATE LAW REQUIRING MANDATORY COMPLIANCE BY ALL CONTRACTORS

- 1.1 **CORPORATE AUTHORITY** - All New Jersey corporations must obtain a Certificate of Incorporation from the Department of the Treasury, Division of Revenue, prior to conducting business in the State of New Jersey.

If a bidder receiving a notice of intent to award is the proposed contract awardee and such bidder is a corporation incorporated in a state other than New Jersey, such bidder must provide either a copy of its Certificate of Authority to do business in New Jersey, issued by the New Jersey Department of the Treasury, Division of Revenue, or evidence of its application to the Division of Revenue for such Certificate of Authority, within seven (7) days of the notice of intent to award.

If the bidder awarded a contract or purchase agreement is an individual not residing in this state or a partnership organized under the laws of another state, then the bidder shall execute a power of attorney designating the State Treasurer as his true and lawful attorney to receive process in any civil action which may arise out of the performance of this contract or agreement. This appointment of the State Treasurer shall be irrevocable and binding upon the bidder, his heirs, executors, administrators, successors or assigns. Within ten (10) days of receipt of this process, the Treasurer shall forward same to the bidder at the address designated herein.

- 1.2 **ANTI-DISCRIMINATION** - All parties to any contract with the State of New Jersey agree not to discriminate in employment and agree to abide by all anti-discrimination laws including those contained within N.J.S.A. 10:2-1 through N.J.S.A 10:2-4, N.J.S.A. 10:5-1 et seq. and N.J.S.A. 10:5-31 through 10:5-38, and all rules and regulations issued there under.
- 1.3 **PREVAILING WAGE ACT** - The New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.26 et seq. is hereby made part of every contract entered into on behalf of the State of New Jersey through the Division of Property Management and Construction, except those contracts which are not within the contemplation of the Act. The bidder's signature on this proposal is his guarantee that neither he nor any subcontractors he might employ to perform the work covered by this proposal has been suspended or debarred by the Commissioner, Department of Labor for violation of the provisions of the Prevailing Wage Act.
- 1.4 **AMERICANS WITH DISABILITIES ACT** - The contractor must comply with all provisions of the Americans With Disabilities Act (ADA), P.L. 101-336, in accordance with 42 U.S.C. 12101 et seq.
- 1.5 **THE WORKER AND COMMUNITY RIGHT TO KNOW ACT** - The provisions of N.J.S.A. 34:5A-1 et seq., which requires the labeling of all containers of hazardous substances is applicable to this contract. Therefore, all goods offered for purchase to the State must be labeled by the contractor in compliance with the provisions of the Act.
- 1.6 **OWNERSHIP DISCLOSURE** - Contracts for any work, goods or services cannot be issued to any corporation or partnership unless prior to or at the time of bid submission the bidder has disclosed the names and addresses of all its owners holding 10% or more of the corporation or partnership's stock or interest.
- 1.7 **COMPLIANCE - LAWS** - The contractor must comply with all local, state and federal laws, rules and regulations applicable to this contract and to the goods delivered and/or services performed hereunder.

- 1.8 COMPLIANCE – STATE LAWS – It is agreed and understood that any contracts and/or orders placed as a result of this proposal shall be governed and construed and the rights and obligations of the parties hereto shall be determined in accordance with the laws of the STATE OF NEW JERSEY.
- 1.9 COMPLIANCE – CODES – The contractor must comply with NJUCC and the latest NEC70, B.O.C.A. Basic Building code, OSHA and all applicable codes for this requirement. The contractor will be responsible for securing and paying all necessary permits, where applicable.

2. LIABILITIES

- 2.1 LIABILITY – COPYRIGHT – The contractor shall hold and save the State of New Jersey, its officers, agents, servants and employees, harmless from liability of any nature or kind for or on account of the use of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, article or appliance furnished or used in the performance of his contract.
- 2.2 INDEMNIFICATION – The contractor shall assume all risk of and responsibility for, and agrees to indemnify, defend, and save harmless the State of New Jersey and its employees from and against any and all claims, demands, suits, actions, recoveries, judgements and costs and expenses in connection therewith on account of the loss of life, property or injury or damage to the person, body or property of any person or persons whatsoever, 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 agreement.
- 2.3 INSURANCE – The contractor shall secure and maintain in force for the term of the contract liability insurance as provided herein. The contractor shall provide the State of New Jersey with current certificates of insurance for all coverages and renewals thereof which must contain the proviso that the insurance provided in the certificate shall not be canceled for any reason except after thirty (30) days written notice to:

STATE OF NEW JERSEY
 Division of Property Management & Construction
 PO Box 034
 Trenton, NJ 08625-0034
 Bid Ref.# _____

The insurance to be provided by the contractor shall be as follows:

- a. General liability policy as broad as the standard coverage forms currently in use in the State of New Jersey which shall not be circumscribed by any endorsements limiting the breadth of coverage. The policy shall be endorsed to include:
1. BROAD FORM COMPREHENSIVE GENERAL LIABILITY
 2. PRODUCTS/COMPLETED OPERATIONS
 3. PREMISES/OPERATIONS

The limits of liability for bodily injury and property damage shall not be less than \$1 million per occurrence as a combined single limit.

- b. Automobile liability insurance which shall be written to cover any automobile used by the insured. Limits of liability for bodily injury and property damage shall not be less than \$1 million per occurrence as a combined single limit.

Worker's Compensation Insurance applicable to the laws of the State of New Jersey and Employers Liability Insurance with limits not less than

\$100,000 BODILY INJURY, EACH OCCURRENT
 \$100,000 DISEASE EACH EMPLOYEE
 \$500,000 DISEASE AGGREGATE LIMIT

3. TERMS GOVERNING ALL PROPOSALS TO NEW JERSEY DIVISION OF PROPERTY MANAGEMENT AND CONSTRUCTION

- 3.1 CONTRACT AMOUNT – The estimated amount of the contract(s), when stated on the Advertised Request for Proposal form, shall not be construed as either the maximum or minimum amount which the State shall be obliged to order as the result of this Request for Proposal or any contract entered into as a result of this Request for Proposal.
- 3.2 CONTRACT PERIOD AND EXTENSION OPTION – If, in the opinion of the Director of the Division of Property Management and Construction, it is in the best interest of the State to extend any contract entered into as a result of this Request for Proposal, the contractor will be so notified of the Director's intent at least 30 days prior to the expiration date of the existing contract. The contractor shall have 15 calendar days to respond to the Director's request to extend the contract. If the contractor agrees to the extension, all terms and conditions of the original contract, including price, will be applicable.

3.3 BID AND PERFORMANCE SECURITY

a) **Bid Security** – If bid security is required, such security must be submitted with the bid in the amount listed in the Request for Proposal. Acceptable forms of bid security are as follows:

1. A properly executed individual or annual bid bond issued by an insurance or security company authorized to do business in the State of New Jersey, a certified or cashier's check, drawn to the order of the Treasurer, State of New Jersey, or an irrevocable letter of credit drawn naming the Treasurer, State of New Jersey as beneficiary issued by a federal insured financial institution.
2. The State will hold all bid security during the evaluation process. As soon as is practicable after the completion of the evaluation, the State will:
 - Issue an award notice for those offers accepted by the State;
 - Return all bond securities to those who have not been issued an award notice.

All bid security from contractors who have been issued an award notice shall be held until the successful execution of all required contractual documents and bonds (performance bond), insurance, etc. If the contractor fails to execute the required contractual documents and bonds within thirty (30) calendar days after receipt of award notice, the contractor may be found in default and the contract terminated by the State. In case of default, the State reserves all rights inclusive of, but not limited to, the right to purchase material and/or to complete the required work and to recover any actual excess costs from the contractor. Collection against the bid security shall be one of the measures available toward the recovery of any excess costs.

b) **Performance Security** – If performance security is required, the successful bidder shall furnish performance security in such amount on any award of a term contractor line item purchase. Acceptable forms of performance security are as follows:

- The contractor shall be required to furnish an irrevocable security in the amount listed in the Request for Proposal payable to the Treasurer, State of New Jersey, binding the contractor to provide faithful performance of the contract.

- The performance security shall be in the form of a properly executed individual or annual performance bond issued by an insurance or security company authorized to do business in the State of New Jersey, a certified or cashier's check drawn to the order of the Treasurer, State of New Jersey, or an irrevocable letter of credit drawn naming the Treasurer, State of New Jersey as beneficiary issued by a federally insured financial institution.

The performance security must be submitted to the State within 30 days of the effective date of the contract award and cover the period of the contract and any extensions thereof. Failure to submit performance security may result in cancellation of contract for cause, and nonpayment for work performed.

3.4 **VENDOR RIGHT TO PROTECT – INTENT TO AWARD** – Except in cases of emergency, bidders have the right to protest the Director's proposed award of the contract as announced in the Notice of Intent to Award. Unless otherwise stated, a bidder's protest must be submitted to the Director within 10 working days after receipt of written notification that his bid has not been accepted or that an award of contract has been made. In the public interest, the Director may shorten this protest period, but shall provide at least 48 hours for bidders to respond to a proposed award. In cases of emergency stated in the record, the Director may waive the appeal period.

3.5 TERMINATION OF CONTRACT

a. **Change of Circumstances**

Where circumstances and/or the needs of the State significantly change, or the contract is otherwise deemed no longer to be in the public interest, the Director may terminate a contract entered into as a result of this Request for Proposal, upon no less than 30 days notice to the contractor with an opportunity to respond.

In the event of such termination, the contractor shall furnish to the using agency, free of charge, such reports as may be required.

b. **For cause:**

1. Where a contractor fails to perform or comply with a contract, the Director may terminate the contract upon 10 days notice to the contractor with an opportunity to respond.

2. Where a contractor continues to perform a contract poorly as demonstrated by formal complaints, late delivery, poor performance of service, short-shipping, etc. the Director may terminate the contract upon 10 days notice to the contractor with an opportunity to respond.
 - c. In cases of emergency, the Director may shorten the time periods of notification and may dispense with an opportunity to respond.
 - d. In the event of termination under this section, the contractor will be compensated for work performed in accordance with the contract, up to the date of termination. Such compensation may be subject to adjustments.
- 3.6 COMPLAINTS – Where a bidder has a history of performance problems as demonstrated by formal complaints and/or contract cancellations for cause, a bidder may be bypassed for this award.
- 3.7 EXTENSION OF CONTRACT QUASI-STATE AGENCIES – It is understood and agreed that in addition to State Agencies, Quasi-State Agencies may also participate in this contract. Quasi-State Agencies are defined in N.J.S.A. 52:27B-56.1 as any agency, commission, board, authority or other such governmental entity which is established and is allocated to a State department or any bi-state governmental entity of which the State of New Jersey is a member.
- 3.8 EXTENSIONS OF CONTRACTS TO COUNTY COLLEGES – N.J.S.A. 18A:64a-25.9 permits any college to participate in any term contract(s) that may be established as a result of this proposal.
- 3.9 EXTENSIONS OF CONTRACTS TO STATE COLLEGES – N.J.S.A. 18A:64-60 permits any State College to participate in any term contract(s) that may be established as a result of this proposal.
- 3.10 SUBCONTRACTING OR ASSIGNMENT – The contract may not be subcontracted or assigned by the contractor, in whole or in part, without the prior written consent of the Director of the Division of Property Management and Construction. Such consent, if granted, shall not relieve the contractor of any of his responsibilities under the contract.

In the event the bidder proposes to subcontract for the services to be performed under the terms of the contract award, he shall state so in his bid and attach for approval a list of said subcontractors and an itemization of the products and/or services to be supplied by them.

Nothing contained in the specifications shall be construed as creating any contractual relationship between any subcontractor and the State.

- 3.11 MERGERS, ACQUISITIONS – If, subsequent to the award of any contract resulting from this Request for Proposal, the contractor shall merge with or be acquired by another firm, the following documents must be submitted to the Director, Division of Property Management and Construction.
- a. Corporate resolutions prepared by the awarded contractor and the new entity ratifying acceptance of the original contract, terms, conditions and prices.
 - b. State of New Jersey ownership disclosure.
 - c. Vendor Federal Employer Identification Number.

The documents must be submitted within thirty (30) days of completion of the merger or acquisition. Failure to do so may result in termination of contract.

3.12 PERFORMANCE GUARANTEE OF BIDDER – The bidder hereby certifies that:

- a. The equipment offered is standard new equipment, and is the manufacturer's latest model in production, with parts regularly used for type of equipment offered; that such parts are all in production and not likely to be discontinued; and that no attachment or part has been substituted or applied contrary to manufacturer's recommendations and standard practice.
- b. All equipment supplied to the State and operated by electrical current is UL listed where applicable.
- c. All new machines are to be guaranteed as fully operational for the period stated in the Request for Proposal from time of written acceptance by the State. The bidder will render prompt service without charge, regardless of geographic location.
- d. Sufficient quantities of parts necessary for proper service to equipment will be maintained at distribution points and service headquarters.

- e. Trained mechanics are regularly employed to make necessary repairs to equipment in the territory from which the service request might emanate within a 48-hour period or within the time accepted as industry practice.
- f. During the warranty period, the contractor shall replace immediately any material which is rejected for failure to meet the requirements of the contract.
- g. All services rendered to the State shall be performed in strict and full accordance with the specifications stated in the contract. The contract shall not be considered complete until final approval by the State's using agency is rendered.

3.13 DELIVERY GUARANTEES – Deliveries shall be made at such time and in such quantities as ordered in strict accordance with conditions contained in the Request for Proposal.

The contractor shall be responsible for the delivery of material in first class condition to the State's using agency or the purchaser under this contract and in accordance with good commercial practice.

Items delivered must be strictly in accordance with the Request for Proposal.

In the event delivery of goods or services is not made within the number of days stipulated or under the schedule defined in the Request for Proposal, the using agency may be authorized to obtain the material or service from any available source, the difference in price, if any, to be paid by the contractor failing to meet his commitments.

3.14 DIRECTOR'S RIGHT OF FINAL BID ACCEPTANCE – The Director reserves the right to reject any or all bids, or to award in whole or in part if deemed to be in the best interest of the State to do so. The Director shall have authority to award orders or contracts to the vendor or vendors best meeting all specifications and conditions. Tie bids will be awarded by the Director.

3.15 STATE'S RIGHT TO INSPECT BIDDER'S FACILITIES – The State reserves the right to inspect the bidder's establishment before making an award, for the purposes of ascertaining whether the bidder has the necessary facilities for performing the contract.

The State may also consult with clients of the bidder during the evaluation of bids. Such consultation is intended to assist the State in making a contract award which is most advantageous to the State.

3.16 STATE'S RIGHT TO REQUEST FURTHER INFORMATION – The Director of the Division of Property Management and Construction reserves the right to request all information which may assist him in making a contract award, including factors necessary to evaluate the bidder's financial capabilities to perform the contract. Further, the Director reserves the right to request a bidder to explain in detail how the bid price was determined.

3.17 MAINTENANCE OF RECORDS – The contractor shall maintain records for products and/or services delivered against the contract for a period of three (3) years from the date of final payment. Such records shall be made available to the State upon request for purposes of conducting an audit or for ascertaining information regarding dollar volume or number of transactions.

4. TERMS RELATING TO PRICE QUOTATION

4.1 PRICE FLUCTUATION DURING CONTRACT – Unless otherwise noted by the State, all prices quoted shall be firm through issuance of contract or purchase order and shall not be subject to increase during the period of the contract.

In the event of a manufacturer's or contractor's price decrease during the contract period, the State shall receive the full benefit of such price reduction on any undelivered purchase order and on any subsequent order placed during the contract period. The Director of DPMC must be notified in writing of any price reduction within five (5) days of the effective date.

Failure to report price reductions will result in cancellation of contract for cause.

4.2 DELIVERY COSTS – Unless otherwise noted in the Request for Proposal, all prices for items in bid proposals are to be submitted F.O.B. Destination. Proposals submitted other than F.O.B. Destination may not be considered. Regardless of the method of quoting shipments, the contractor shall assume all costs, liability and responsibility for the delivery of merchandise in good condition to the State's using agency or designated purchaser.

F.O.B. Destination does not cover "spotting" but does include delivery on the receiving platform of the ordering agency at any destination in the State of New Jersey unless otherwise specified. No additional charges will be allowed for any additional transportation costs resulting from partial shipments made at contractor's convenience when a single shipment is ordered. The weights and measures of the State's using agency receiving the shipment shall govern.

- 4.3 C.O.D. TERMS – C.O.D. terms are not acceptable as part of a bid proposal and will be cause for rejection of a bid.
- 4.4 TAX CHARGES – The State of New Jersey is exempt from State sales or use taxes and Federal excise taxes. Therefore, price quotations must not include such taxes. The State's Federal Excise Tax Exemption number is 22-75-0050K.
- 4.5 PAYMENT TO VENDORS – Payment for goods and/or services purchases by the State will only be made against State Payment Vouchers. The State's form, together with the original Bill of Lading, express receipt and other related papers must be sent to the consignee on the date of each delivery. Responsibility for payment rests with the using agency which will ascertain that the contractor has performed in a proper and satisfactory manner in accordance with the terms and conditions of the award. Payment will not be made until the using agency has approved payment.

For every contract, the term of which spans more than one fiscal year, the State's obligations to make payment beyond the current fiscal year is contingent upon legislative appropriation and availability of funds.

The State of New Jersey now offers State contractors the opportunity to be paid through the VISA procurement card (p-card). A contractor's acceptance and a State Agency's use of the p-card, however, is optional. P-card transactions do not require the submission of either a contractor invoice or a State payment voucher. Purchasing transactions utilizing the p-card will usually result in payment to a contractor in three days. A contractor should take note that there will be a transaction processing fee for each p-card transaction. To participate, a contractor must be capable of accepting the VISA card. For more information, call your bank or any merchant services company.

- 4.6 NEW JERSEY PROMPT PAYMENT ACT – The New Jersey Prompt Payment Act N.J.S.A. 52:32-32 et seq. Requires state agencies to pay for goods and services within sixty (60) days of the agency's receipt of a properly executed State Payment Voucher or within sixty (60) days of receipt and acceptance of goods and services, whichever is later. Properly executed performance security, when required, must be received by the State prior to processing any payments for goods and services accepted by State agencies. Interest will be paid on delinquent accounts at a rate established by the State Treasurer. Interest will not be paid until it exceeds \$5.00 per properly executed invoice.

Cash discounts and other payment terms included as part of the original agreement are not affected by the Prompt Payment Act.

- 4.7 RECIPROCITY – The State of New Jersey will invoke reciprocal action against an out-of-State bidder whose State or locality maintains a preference practice for their bidders.
- 5 CASH DISCOUNTS – Bidders are encouraged to offer cash discounts based on expedited payment by the State. The State will make efforts to take advantage of discounts, but discounts will not be considered in determining the lowest bid.
- a. Discount periods shall be calculated starting from the next business day after the recipient has accepted the goods or services, received a properly signed and executed State Payment Voucher form and, when required, a properly executed performance security, whichever is latest.
- b. The date on the check issued by the State in payment of that Voucher shall be deemed the date of the State's response to that Voucher.
6. STANDARDS PROHIBITING CONFLICTS OF INTEREST – The following prohibitions on vendor activities shall apply to all contracts or purchase agreements made with the State of New Jersey, pursuant to Executive Order No. 189 (1988).
- 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 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 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 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 N.J.S.A. 52:13D-13g. Any relationship 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 officer 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.

SECTION 21 32 13 - ELECTRICAL DRIVEN VERTICAL TURBINE FIRE PUMPS WITH PRE-FABRICATED PUMP HOUSE

PART 1- GENERAL

1.01 DESCRIPTION

- A. Provide packaged fire protection pumps and house in accordance with the Contract Documents.

1.02 WORK INCLUDED

- A. Fire Protection Pumps built in a Pre-Fabricated Pump House designed in accordance with the requirements of NFPA 20.
- B. Provide instruction manuals to GC for installation, testing and all other required work (including connections) to complete the system commissioning. Coordinate the lifting and installation of pump house and all required connections (including electrical, plumbing and fire alarm connections). Provide personnel for field startup and testing of equipment.

1.03 SUBMITTALS

- A. Catalog Data: Manufacturer's literature and illustrations.
- B. Shop Drawings
 - 1. Dimensions.
 - 2. Detail of valving and piping arrangements.
 - 3. Wiring diagram of prewired controllers, required control wiring and power wiring diagrams.
 - 4. Written description of sequence of operation.
 - 5. Pump curves indicating service conditions.
- C. Installation: Manufacturer's installation instructions to GC.
- D. Operating Instructions: Written operating instructions including start-up and shutdown to GC.
- E. Maintenance Data to GC
 - 1. Written instructions on items requiring periodic maintenance.
 - 2. Parts List.
- F. Factory Tests and Certificates (to consultant/owner)
 - 1. Pumps hydraulically tested for pressure/flow performances.

2. Provide certified test data.

G. Responsibility of Manufacturer

1. The manufacturer shall be responsible for the complete pumping system and shall guarantee pumps, motors, control and all components of the pumping system.

1.04 QUALITY ASSURANCE

A. Factory Mutual (FM)

B. Underwriters Laboratories

C. National Fire Protection Association (NFPA)

D. Local authorities.

E. Manufacturer of the specified equipment shall be a business regularly engaged in the manufacture, assembly, construction, start up, and maintenance of fire pumping distribution equipment of the type required for this project. The manufacturer shall have at least ten (10) years of successful experience in providing stations of the type, design, function, and quality as required for this project.

F. Provide earthquake restraint systems as required by State Building Code and any required calculations.

1.05 ABBREVIATIONS

A. Factory Mutual (FM)

B. Underwriters Laboratories (UL)

C. National Fire Protection Association (NFPA)

D. Outside Screw and Yoke (OS&Y)

E. National Electrical Manufacturers Association (NEMA)

F. American Society for Testing and Materials (ASTM)

PART 2- PRODUCTS

2.01 GENERAL

A. All pumps shall be as scheduled in the specifications.

B. Pumping systems shall be complete with all necessary controls, starters and alarms.

C. All pumps shall be U.L. listed and FM approved.

2.02 FIRE PUMPS ACCESSORIES

- A. The system manufacturer shall furnish accessories as follows:
 - A. 1 ½" automatic air release valve
 - B. 3 ½" Discharge pressure gauge
 - C. ¾" relief valve
 - D. Flush dome type hose valve header, 125# flanges with chains and caps, including UL/FM butterfly isolation valve with tamper switch complete with wiring to alarm panel – by others
 - E. 3 brass 2.5" hose gate valve, NST angle (To be stored near pump)
 - F. Piping for the jockey pump, which includes two (2) OS&Y gate valves and a check valve, with necessary tees, elbows, and pipe tappings.
 - G. Mounting of all named equipment on an open I-Beam structural steel base.
 - H. All pressure-sensing lines are to be piped in hard type "L" copper or brass piping in Accordance with NFPA 20 guidelines.
 - I. Wiring between drivers and their controllers is to be in rigid conduit which is countersunk and run through the centers of the inner support members of the skid in accordance with OSHA safety recommendations and to provide the owner with a professionally "finished" appearance to pump house.
 - J. UL/FM system wafer check valve, UL/FM system butterfly valve complete with tamper switch and wiring to alarm panel by contractor.

2.03 AUTOMATIC FIRE PUMP MOTOR CONTROLLER

- A. The fire pump controller shall be a UL/FM labeled combination manual and automatic type. Provide soft start controller with floor mounted start/stop push buttons, 0-300# pressure transducer, minimum run timer.
- B. The enclosure NEMA 2 floor mounted and meeting the requirements of the most recently mandated edition of NFPA 20 and shall be listed by Underwriters Laboratories and approved by Factory Mutual.
- C. The withstand rating of the controller shall not be less than 100,000 RMS Symmetrical at 460 volts.
- D. The controller shall include a motor rated combination isolating disconnect switch/circuit breaker, mechanically interlocked and operated with a single, externally mounted handle. When moving the handle from OFF to ON, the interlocking mechanism shall sequence the isolating disconnect switch ON first and then the circuit breaker. When the handle is moved from ON to OFF, the mechanism shall sequence the circuit breaker open first, and then the isolating disconnect switch. The isolating disconnect switch and circuit breaker shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated defeater mechanism.

- E. The controller shall have a minimum running period timer set for ten minutes. Terminals shall be provided to field convert the controller from automatic to manual shutdown.
- F. The controller shall have externally mounted, individual visual indicators for POWER AVAILABLE, LOW PRESSURE, LOCAL START, REMOTE START, DELUGE VALVE OPEN, PHASE FAILURE, PHASE REVERSAL, INTERLOCK ON, PUMP RUNNING, LOW ROOM TEMPERATURE, and RUN TIMER ON. The controller shall be supplied with duplicate individual PHASE FAILURE, PHASE REVERSAL, PUMP RUNNING, and LOW ROOM TEMPERATURE alarm contacts.
- G. The controller shall have a USB port for recording pressure.
- H. The power transfer switch shall be designed for use with Generator set emergency power source. Firetrol Model FTA950 Automatic power transfer switch for Generator back-up.
- I. The power transfer switch shall include a motor rated disconnect/isolating switch capable of interrupting the motor locked rotor current. The disconnect/isolating switch shall be mechanically interlocked so that the enclosure door cannot be opened with the handle in the ON position except by a hidden tool operated defeater mechanism.
- J. The transfer switch circuitry shall be capable of sensing both the normal power source and the emergency source. The normal power source pick up shall be set at 90% nominal voltage and 95% nominal frequency. All voltage sensing, frequency sensing, and time delays shall be field adjustable. The transfer signal shall be delayed for one second, delaying the transfer and engine start signals so as to override momentary normal power outages.
- K. The transfer switch shall have TRANSFER SWITCH NORMAL, TRANSFER SWITCH EMERGENCY, and EMERGENCY ISOLATING SWITCH OFF pilot lights, TEST, and SILENCE ALARM pushbuttons mounted on the flange of the enclosure. The transfer switch shall be electrically operated and mechanically held, and shall be capable of being operated by a manual transfer mechanism located on the switch.
- L. The transfer switch must be manufactured by the fire pump controller manufacturer and be in the same enclosure and rated for fire service.

2.04 JOCKEY PUMP MOTOR CONTROLLER

- A. The jockey pump controller is to be UL Listed, complete with pressure transducer, run period timer, fusible disconnect, Hand-Off-Automatic selector switch and a pressure switch in a wall mounted NEMA 2 enclosure. Provide jockey pump controller to match available power supply same as the main fire pump or equivalent.
- B. Provide the following items:
 - 1. Running period timer

2. Control circuit transformer
3. Pump operating pilot light
4. Power available pilot light
5. Digital display of pressure

2.05 VERTICAL TURBINE FIRE PUMP

- A. The fire-pumping system shall be designed to deliver 750 GPM when operating at 110 PSI using a 60HP Motor. The pump shall also deliver not less than 150% of rated capacity at a pressure not less than 65% of rated pressure. Motor and pump speed shall not exceed 1750 RPM. Unit pressure shut-off head shall not exceed 140% of rated pressure. Supply power to the system shall be 460 Volts, 3 phase, 60 Hertz. Pump is to be a vertical turbine type for Fire Pump service constructed in accordance with NFPA-20, UL 448 and approved by U.L. and F.M..
- B. The water supply for the fire pump shall be from an aboveground concrete tank of 22,500 gallons.
- C. The total installed length of the pump from bottom of baseplate to bottom of suction inlet manifold shall be 13 feet. The pump discharge head assembly shall be cast iron and fitted with a discharge connection machined to ANSI 125/250 rating dimensions. The pump discharge head shall provide rigid mounting support for the complete pump assembly and for the vertical hollow shaft motor. The pump line shaft bearings shall be water lubricated by the water being pumped.
- D. Pump column pipe shall be in sections not longer than 10 feet each. Pump bowl assemblies shall include cast iron enameled bowls, cast bronze impellers and bowl lateral seal rings. Pump bowl assemblies shall be submerged as recommended in NFPA Pamphlet 20. Each pump shall be installed with a cast or fabricated nonferrous metal strainer having a free area of not less than four times the suction inlet area. Strainer openings shall be sized to restrict the passage of objects one-half inch sphere size.
- E. The pump driver shall be a vertical hollow shaft induction motor of horsepower shown on drawings. The motor locked rotor current shall not exceed the values stated in NFPA Pamphlet 20. The motor shall be constructed so that the total hydraulic and static thrust of the pump's rotating assembly can be carried by the motor thrust bearings. The motor shall mount directly on the pump discharge head assembly with a registered fit for correct shaft alignment. The motor shall be equipped with a top drive coupling and nut for axial adjustment of the pump impellers and shall have a non-reverse ratchet to prevent pump back-spin.
- F. The pump manufacturer shall furnish piping accessory items for the pump installation which will adapt the pump connections to the fire protection system and test connections as follows: Fire pump fittings which are subjected to pump discharge pressure shall be ANSI 125 250 pound rating.
- G. BOWLS:

1. ASTM A48 Class 30 cast iron, designed for maximum efficiency and long life. Pump shall consist of suction nozzle, bow assembly and discharge case for connecting to the discharge column pipe.
- H. IMPELLERS:
1. ASTM B584-636 bronze, enclosed type with non-overloading characteristics. All water passages shall be smooth surfaces. Impellers shall be fastened to pump shaft by means of ASTM AS62A I 655 collets or ASTM A582-303SS keys.
- I. BOWL WEAR RING:
1. ASTM B144 bronze secured to the bowl with a pressed fit and shall be renewable.
- J. PUMP SHAFT
1. Shall be ASTM AS82, Grade 416 stainless steel. Line shaft shall be the same.
 2. Coordinate required length of shaft with drawings.
- K. BOTTOM BEARING:
1. ASTM 8505, alloy 836 bronze sleeve type fully enclosed in bearing shell provided with large grease reservoir. Bearing shall be packed with non-soluble grease or approved equal. A sand collar of ASTM B505-836 bronze shall be provided.
- L. INTERMEDIATE BEARING:
1. Furnish at each bowl assembly and shall be ASTM B505, alloy 836 bronze.
- M. LINE SHAFT BEARING:
1. Synthetic rubber, water lubricated bearings shall be used. The bearing shall be held in an ASTM A48, Class 30 cast iron spider cast integral with pipe coupling and fitted with a bronze bearing retaining ring. Bearings shall have a maximum spacing of 10'0".
- N. STUFFING BOX:
1. An ASTM A48, Class 30 cast iron stuffing box shall be provided containing an ASTM B505-836, bronze bearing, graphite impregnated backing with a bleed-off connection and grease lubricating connection to a lantern ring. A bronze, split type packing gland shall be employed. Separator rings shall be furnished between each ring of packing to prolong packing life.
- O. COLUMN PIPE:
1. Shall be ASTM A53 steel pipe having screwed coupled connections. Coordinate required length with drawings and provide required supports.
- P. DISCHARGE HEAD AND MOTOR STAND:
1. Shall be ASTM A48 Class 30 cast iron, one-piece construction with a circular-mounting base. The top of the discharge head shall be machined with a rabbet fit to facilitate alignment of the motor and pump shaft. The

height of the discharge head shall permit coupling the line shaft to the motor drive shaft above the stuffing box. The outlet flange shall be 125 pound ANSI standard flat face.

Q. STRAINER:

1. Bronze basket or cone type strainer is to be provided. The bowls and head shall be hydrostatically tested to twice the shut-off head, but not less than 250 PSI. The pump shall be given a complete laboratory performance test, recording not less than 5 points including shut-off head, dully point and 150% of rated capacity point at a head not less than 65% of rated head. Shut-off head shall not exceed 140% of rated head.

R. MOTOR:

1. Motor shall be vertical hollow shaft squirrel cage induction type with non-reverse ratchet and thrust bearings with minimum 2 year bearing life (10-year average) and momentary up-thrust protection. Motor shall be 75 HP 1750 RPM 460 volts 3 phase, 60 cycle ODP and not exceeding 600 volts. Enclosure shall be weather-protected type 1. The motor shall have a 1.15 service factor, Class B insulation with NEMA design B at design point. The motor locked rotor current shall not exceed the values as stated in NFPA 20.

2.06 JOCKEY PUMP

- A. The jockey pump is to be a Vertical Submersible Turbine jockey pump with mechanical seal. Designed for 15 GPM at 125 PSI, complete with a 3450 RPM, 2 HP motor vertical, and submersible motor. Motor voltage and phase are to be same available power supply same the main fire pump.

2.07 PREFABRICATED ENVIRONMENTAL ENCLOSURE

- A. Building Size shall be 12'-3" wide X 14' long X 9'-9" high. A clear height of 7'-8" shall be maintained within the room. Additional 2 feet wall space, wall openings and power feed is to be provided for suction tank electric heater (freeze prevention) control/status panel. Building is to be supplied complete with all necessary component parts, to form a complete building system and all parts shall be new and free from all defects or imperfections. The building width and length shall be measured from the outside of the building wall panels and the height of the building shall be the distance measured from the bottom surface of the base channel to the exterior juncture of the roof and sidewall panels and will require a building state certification.

- B. Factory exteriors color of building and roof to be Tan or White as selected by architect.

C. GENERAL

1. Environmental enclosures shall be constructed with prefabricated wall and ceiling panels formed to exact size as described below and manufactured by Kysor Panel Systems, Fort Worth, TX or Trachte, Oregon, WI or equivalent.

D. INSULATION

1. House shall be provided with 2 hour fire wall as required by NFPA 20. Insulation shall be 100% rigid urethane with an at temperature conductivity factor (K factor) not to exceed 0.128 Btu/hr. Urethane is to be poured in place with a density of 2.2 pounds per cubic foot. Overall coefficient of heat transfer (U factor) and R value to be as follows:
24 (Walls) and 34 (ceiling)
2. This insulation shall be a listed urethane with a rating of no more than 25 for flame spread and 450 for smoke developed per ASTM E84. This urethane shall also meet the ignition properties requirements of ASTM D-1929.

E. MODULAR PANEL CONSTRUCTION

1. All panels to be constructed with die-formed interior and exterior metal pans securely fastened to a perimeter frame of kiln dried spruce-pine-fir (SPF) specie, #2 grade lumber. Perimeter frame to feature tongue and groove profile for positive alignment and sealing. Panel shall be filled with poured-in-place urethane, securely bonded to metal pans and perimeter frame to create a rigid structural panel with a tough, resilient, shock-resisting surface. Provide standard panels, interchangeable, for ease of assembly. Provide special panels, if required, manufactured to the size required to obtain a specified building size. Provide pressure treated (Chemicals) perimeter bracing.

F. PANEL FASTENERS

1. Provide cam-lock fasteners to ensure a tight and positive seal, and reduce on-the-job installation time. Fastener material shall be steel housing, hook and pin with high-pressure die-cast zinc cam. Hardened steel hexagonal wrench is provided to tighten panel fasteners. The hook of the fastener shall engage over the pin when rotating the wrench and with cam-action, draw the panels tightly together. Polyethylene snap-in caps cover the wrench holes. Lock spacing shall not exceed 48" on center.

G. PANEL GASKETS

1. Each joint shall exhibit a polyvinyl chloride (PVC) bulb type; compression gasket to eliminate water vapor permeability. All gaskets are factory installed and require no additional handling. Gaskets shall be resistant to chemical corrosion and ultraviolet radiation. Gasket operating temperature shall be -34 degrees C to +71 degrees C (-30 degrees F to +160 degrees F).

H. FINISHES

1. Provide interior and exterior metal pans as follows:
Galvanized Steel: Tan Embossed 22 gauge or White as selected by Architect

I. METAL COMMERCIAL DOORS

1. Door shall be seamless, constructed of two face sheets of 18 gauge cold rolled steel, stretcher-leveled quality of flatness. Vertical edges of doors shall have neat hemmed edge seam mechanically interlocked for maximum structural integrity. All hinge reinforcements shall be of 8

gauge steel projection welded to door. Doors for exterior shall be 1-3/4" thick, 4'-0" x 7'-0".

Widths

X 7'-0" Double

Sizes

exhaust fan

2. The number of doors, their location and direction of swing is shown on the plans.
3. Standard frames shall be double rabbeted 16 gauge cold rolled steel. Frames shall be mitered, face welded and ground smooth. All hinge reinforcements shall be of 8 gauge steel projection welded to frame. Reinforcements for strike and surface mounted hardware shall be a minimum of 14 gauge. Frames shall be furnished with a factory installed rubber mutes, 3 per strike jamb.
4. Doors and frames shall be factory painted with one coat of baked on primer. All doors shall be preassembled in their frames and hardware installed and tested prior to shipment. Field installation of the door unit shall not require any frame assembly, door handling or hardware installation.
5. Provide door hardware, including non-removable pin butt hinges with individual lockset and accessories, for exterior doors as follows:
 - a) Hinges: 1-1/2" pair (per door), 4-1/2" x 4-1/2", stainless steel. (U.S. 32D), non-removable pins
 - b) Keyed lockset with storeroom function (US 32D).
 - c) Hasp & Staple: 7" extra heavy type, cadmium plated.
 - d) Head Bolt: 6" long with 24" chain, cadmium finish.
 - e) Foot Bolt: 6" long, cadmium finish.
 - f) Weatherstripping
 - g) Threshold: aluminum
 - h) Door stop and latch

J. ROOF HATCH

1. Roof hatch will be designed per the pump selection size.

K. COMPOSITE TESTING

1. Provide panel systems that meet the requirements of the following:
 - (a) Flame spread and smoke developed per UL-723, ASTM E-84 and Chapter 26 of the International Building Code
 - (b) Ignition properties per ASTM D-1929
 - (c) Factory Mutual Standard 4894

L. REGULATIONS AND CODES

1. All work and materials shall be in full accordance with local and State Building Code. Provide all items required by the regulations and codes, but not necessarily specified herein or shown on the drawings.

M. CAULKING AND SEALANTS

1. Insulated panels shall be set on galvanized "Z" base trim, secured to concrete slab, with non-drying butyl caulking. All openings and penetrations through insulated panels shall be sealed with silicone sealant. Clean and degrease applicable surfaces.

N. INSTALLATION

1. Install in complete accordance with the manufacturer's printed instructions.

O. LOUVERS

1. Louvers shall be the "fixed" type with insect screen. Louver frame shall be made from 22 gauge galvanized steel. Louvers shall be horizontally centered and set into 47" insulated panels.

P. EXHAUST FANS

1. Provide manufacturer standard exhaust fan.

Q. ROOF SYSTEM

1. Provide a prefabricated roof system for the enclosure, complete with roof hatch, to provide a waterproof covering for insulated ceiling panels.
2. Roof system shall be galvanized standing seam, 22 gauge, 16 inches wide, sheet metal over ceiling panels with a slope of 1/4" per foot. Fasteners shall be corrosion resistant rubber washered Tek screws with length and strength required for metal to be fastened.
3. Provide an additional 2 feet extension of the roof for future installation of external electrical panels.

R. GUTTERS AND DOWNSPOUTS

1. Provide enclosure complete with gutters and downspouts, standard metal finishes to match the finish on the insulated panels.

S. EQUIPMENT SUPPORT BLOCKING

1. Provide all blocking as required to support pump equipment indicated. Coordinate with pump supplier.

T. SKID MOUNT

1. Provide steel skid mount, to receive pump system, ready for casting in concrete floor.

U. ELECTRICAL CONTINUITY

1. Grounding plate with threaded lugs and mechanically fastened continuity trim are available upon request.

V. WALL OPENINGS

1. The building manufacturing is to supply all necessary framing and connectors to structurally replace the panel removed by any wall or roof openings. The supplier of the unit being installed shall provide all trim

and flashing required to make weather-tight the unit placed in any opening.

W. INSTALLED ACCESSORIES

1. (2) 3 1/2 KVA CFM space heaters with wall mounted thermostat (Each sized per local weather requirements for proper CFM) to handle full heating requirements in case of one unit failure.
2. (1) Motorized Damper
3. (1) Duplex battery powered interior emergency lighting
4. (1) Duplex wall mounted GFCI convenience outlet
5. (1) Overhead automatic sprinkler system with flow sensor per NFPA 13
6. (1) 100-amp service entrance rated disconnects provided and installed per NEC and NFPA 20.
7. (1) Exhaust Fan & Thermostat
8. (2) 100W Fluorescent Vapor Tight Lights
9. (6) 15 AMP Single Pole Circuit Breakers
10. Exterior 70 W High Pressure Sodium Wall Pack with Photocell
11. (1) Low Temperature Alarm wired to remote panel to be located in the office or as directed. Provide connection point in panel for connection to fire alarm system to send an alarm to the fire department central system, to notify fire department no heat. Coordinate all work with electrical contractor.
12. 6" solenoid and float operated diaphragm type fill valve to suction tank to be supplied. Control panel to be installed in enclosure.

X. FACTORY PREFABRICATION

1. All of the above equipment is to be mounted on an open I-Beam structural steel skid having recessed inner support members. All piping, pressure-sensing lines, shut off valves, stuffing box, and casing relief drain lines shall be firmly anchored to the steel base by means of structural steel supports. All electrical wiring between drivers and controller is to be ran in rigid conduit, countersunk and ran through the center of the inner support members of the skid.
 - (a) Coordinate with drawings for additional information.
2. All equipment shall be factory tested by the system manufacturer in accordance with NFPA 20, UL and FM prior to shipment. Additionally, the system manufacturer prior to shipment shall hydrostatically test the entire package. The unit shall be built and tested in an enclosed weatherproof shop and the manufacturer shall provide a certified X-Y plot test report prior to shipping of the system for engineering approval.

Y. THIRD PARTY CERTIFICATION

1. All packaged equipment shall be independently Third Party labeled as a system suitable for the intended use by a Nationally Recognized Testing Laboratory (NRTL) in accordance with OSHA Federal Regulations 29CFR1910.399 and NFPA 70, National Electric Code (NEC), Article 90-7.

2.08 ACCEPTABLE MANUFACTURERS

A. Fire Pump

1. Peerless Pump Company
 2. Patterson Pump
 3. Aurora Pump Company
 4. Or Approved Equal
- B. Jockey Pump
1. Grundfos
 2. MTH Pumps
 3. Or Approved Equal
- C. Fire Pump Controllers, Jockey Pump Controllers, Automatic Transfer Switch
1. Firetrol
 2. Cutler Hammer
 3. Hubbell
 4. Joslyn Clark
 5. Or Approved Equal

2.09 INSTALLATION

- A. Completely align and level pumps, motors and bases. Where pumps and motor are shipped as a unit, realign them in the field.
- B. Grout base plates completely to provide a non-deflecting support.
- C. Secure pumps to bases with proper size anchor bolts.
- D. Install and align mechanical seals in accordance with the manufacturer's recommendation.
- E. Pump manufacturer to set packing, adjust impellers and check alignment prior to start-up.
- F. Each concrete base (rectangular or 'T' shaped) for horizontally split pumps to include supports and base elbows for the suction and discharge connections. Base elbows to be bolted and grouted to the concrete foundation.
- G. Construct all apparatus of materials and pressure ratings suitable for the conditions encountered during continuous operation.
- H. Provide casing connections for vent, drain, suction and discharge pressure gauges.
- I. Balance impellers and all other moving components statically and dynamically.

- J. Match centrifugal pump impellers and casings so that at specified operating conditions the impeller diameter is not more than 90% of the maximum diameter impeller which can satisfactorily operate in the casing.
- K. Pumps must operate stably without pulsation, vibration or internal recirculation. Pump operating characteristics at the design point must be such that a variation of 10% in head results in not more than a 15% variations in gpm and does not affect the stability of operation of the pump.
- L. Select pumps so that when operating at rated RPM, the pump motor cannot be overloaded despite variations in pumping head.
- M. Coordinate all openings required for pump installations, access, etc. through pre-cast concrete top slab and walls as necessary with pre-cast supplier.

2.10 FACTORY TEST, FIELD ACCEPTANCE AND PERFORMANCE TEST

- A. All equipment will be factory tested in accordance with the requirements of N.F.P.A., U.L., and F.M. Additionally, the entire package system will be hydrostatically tested by the system manufacturer prior to shipment.
- B. The system manufacturer representative, shall be present and conduct the start up and field acceptance test. The pump, motor, and controller shall meet the intent of the specifications and outlines set forth in NFPA 20. Provide 5 man days minimum.
- C. Training shall be onsite instruction to owners representatives for system review and operation. A minimum of 5 (five) days' notice is to be given to the owner to establish a time for this review. Provide 2 man days minimum.
- D. Fire pump manufacturer will be required to submit a notarized Certificate of Compliance certifying that all components of the fire pump unit were in fact supplied by the fire pump manufacturer and acknowledging its responsibility for the proper function of the unit.

2.11 WARRANTY

- A. The standard manufacturer warranty shall be for full-value replacement for a minimum of two (2) years from the date the Owner approves/accepts the Contractor's Letter of Final Completion. The standard warranty shall include all necessary routine maintenance on all equipment included in this prepurchase package.
- B. The pre-packaged fire pumping system and house shall have a guarantee in writing by the manufacturer for a period of 2 years from the date of substantial completion of the project against defect in design, material or construction. The Manufacturer shall provide a written Agreement which will include the desired warranty period and all preventive maintenance required during the warranty period of the equipment in order to comply with the Contract requirements.

- C. All equipment shall be new, of first-class material, and of a proven design. Workmanship shall be of the best quality, free from any defects that might render the equipment unsuitable or inefficient for the purpose for which it is to be used. The manufacturer shall guarantee that, during the construction phase, a qualified service representative will respond to the site within a maximum of four (4) hours of notification. The service person shall be capable of affecting all necessary repairs and restoring the system.
- D. Although the guarantee shall be enforceable as provided, no requirement of this Contract with respect to guarantees by the manufacturer shall be deemed to be a limitation upon any rights which the Owner would have, either expressed or implied, in the absence of such guarantees, the said guarantee being given only for the greater assurance of the Owner.
- E. At Bid provide an additional cost to extend the warranty to 5 years

PART 3- EXECUTION (for reference)

This part lists the work that will be the responsibility of the General Contractor in order to complete the fire pump house installation. The fire pump house supplier shall highlight any exceptions to the GC's scope of work as part of the bid submittal. If none is highlighted, it will be assumed that this supplier will provide all the other work not listed in this section for completion of the fire pump house installation.

3.01 GENERAL

- A. GC shall coordinate schedule of delivery with the fire pump house supplier
- B. GC shall unload the fire pump house from flat bed truck, lift and install fire pump house delivered to site by fire pump house supplier.
- C. GC shall set the house in place and secure it to the floor slab
- D. GC shall provide all required plumbing, electrical connections to the fire pump house
- E. GC to install supplied solenoid and float operated diaphragm type fill valve and provide all wiring to tank fill control panel.
- F. GC shall supply and install suction tank electric heater and coordinate space for panels and required openings for control panel and wiring.
- G. GC shall pour concrete for foundation pad
- H. GC shall provide steel diamond plated access hatch cover and frame for 3'x3' tank access. Cover shall be 2 pieces, hinged and airtight.
- I. GC to coordinate field test of the fire pump house done by fire pump supplier representative. The pump, motor, and controller shall meet the intent of the specifications and outlines set forth in NFPA 20.

END OF SECTION

SECTION 21 32 13 A - SCHEDULE OF TECHNICAL DATA

Electrical Driven Main Fire Pump

Make / Manufacturer : _____

Quantity : _____

Liquid Handled : _____

Rated Discharge GPM : _____

Rated Discharge PSI : _____

Model : _____

Vertical/Horizontal Design : _____

Speed / No. of Stages : _____

Impeller Dia (Maximum) : _____

Suction / Delivery Size : _____

Efficiency at Rated Capacity & Head: _____

HP required at rated capacity & head: _____

Shut Off Head : _____

Material of Construction

Pump Casing : _____

Impeller : _____

Pump Shaft : _____

Shaft Sleeve : _____

Casing Wearing Ring : _____

Base Plate : _____

Make/Material of Packing Seal : _____

UL/FM Approval listing: _____

Description of Motors

Make : _____

Model No. : _____

Type : _____

Frame size : _____

Speed (RPM) : _____

Rated Capacity (Power) : _____

Full load current : _____

Enclosure : _____

Coupling / Pulley : _____

Class of Insulation: _____

SECTION 21 32 13 B - SCHEDULE OF TECHNICAL DATA

Jockey Pump

Liquid Handled : _____

Rated Discharge GPM : _____

Rated Discharge PSI: _____

Model : _____

Horizontal / Design : _____

Speed / No. of Stages : _____

Impeller Dia (Maximum) : _____

Suction / Delivery Size : _____

Efficiency at Rated Capacity & Head: _____

HP required at rated capacity & head: _____

Shut Off Head : _____

Material of Construction

Pump Casing : _____

Impeller : _____

Pump Shaft : _____

Shaft Sleeve : _____

Casing Wearing Ring : _____

Base Plate : _____

Make of Mechanical Seal : _____

Description of Motor

Make : _____

Model No. : _____

Type : _____

Frame size : _____

Speed (RPM) : _____

Rated Capacity (Power) : _____

Full load current : _____

Enclosure : _____

Coupling / Pulley : _____

SECTION 21 32 13 C - SCHEDULE OF TECHNICAL DATA

ELECTRICAL ACCESSORIES

Motor Control Center (Electrical Panel) _____

Vacuum circuit breaker _____

Air circuit breaker _____

MCCB _____

MCB _____

Rotary switch _____

Soft Starter (for fire pump) _____

Contactor _____

Current Transformer (cast resin type) _____

Single phase preventor _____

Push Button _____

Change over switch _____

Ammeter & Voltmeter _____

KWH meter _____

Relay _____

Indication lamp _____

Cables _____

Wires _____

SECTION 232123 - HYDRONIC PUMPS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Close-coupled, in-line centrifugal pumps.
 - 2. Separately coupled, base-mounted, end-suction centrifugal pumps.

1.03 DEFINITIONS

- A. Buna-N: Nitrile rubber.
- B. EPT: Ethylene propylene terpolymer.
- C. HI: Hydraulic Institute Standards
- D. NEMA: National Electric Manufacturers Association
- E. TEFC: Totally Enclosed Fan Cooled

1.04 SUBMITTALS

- A. Product Data: For each type of pump. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.
- B. Wiring Diagrams: Power wiring.
- C. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.
- D. Quantities in accordance with Division 1 requirements.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanical Seals: One mechanical seal(s) for each pump.

1.06 QUALITY ASSURANCE

- A. Source Limitations: Obtain Hydronic pumps through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles and dimensional requirements of Hydronic pumps and are based on the specific system indicated.
- 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. UL Compliance: Comply with UL 778 for motor operated water pumps.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of centrifugal pumps that fail in materials or workmanship within specified warranty period.
 1. As part of bid, provide additional cost to extend warranty to 5 years from date of substantial completion.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment with protective crating and covering.
- B. Store equipment to prevent damage and protect from weather, dirt, fumes, water, and construction debris until final delivery date to the construction site.

PART 2 - PRODUCTS

2.01 MOTOR CHARACTERISTICS

- A. 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.

2.02 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.

- D. Rotor: Random-wound, squirrel cage.
- E. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- F. Temperature Rise: Match insulation rating.
- G. Insulation: Class F
- H. Code Letter Designation:
 - 1. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

2.03 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Variable Frequency Controllers:
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.04 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Basis of Design product or comparable product by one of the following:
 - 1. Armstrong Pumps Inc.
 - 2. ITT Corporation; Bell & Gossett.
 - 3. TACO Incorporated.
 - 4. Or Approved Equal
- B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically.
- C. Pump Construction:
 - 1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet, replaceable bronze wear rings, and threaded companion-flange connections.
 - 2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. trim impeller to match specified performance.
 - 3. The pumps shall be close-coupled, inline for vertical or horizontal installation, in cast iron bronze fitted construction specifically designed for quiet operation. The pump internals shall be capable of being serviced without disturbing piping connections.
 - 4. The pumps shall have a solid alloy steel shaft that is integral to the motor. A non-ferrous shaft sleeve shall be employed to completely cover the wetted area under the seal.

5. The motor bearings shall support the shaft via heavy-duty grease lubricated ball bearings.
6. Pump shall be equipped with an internally flushed mechanical seal assembly installed in an enlarged tapered seal chamber. Seal assembly shall have a brass housing, Buna bellows and seat gasket, stainless steel spring, and be of a carbon ceramic design with the carbon face rotating against a stationary ceramic face.
7. Pump shaft shall connect to a brass impeller. Impeller shall be hydraulically and dynamically balanced to Hydraulic Institute Standards ANSI/HI 9.6.4.5-2000. The allowable residual imbalance conforms to ANSI grade 6.3, keyed to the shaft and secured by a stainless steel locking capscrew or nut.
8. Pump should be designed to allow for true back pull-out access to the pump's working components for ease of maintenance.
9. Pump volute shall be of a Class 30 cast iron design for heating systems rated for 175 PSIG with integral cast iron flanges drilled for 125# ANSI companion flanges. Volute shall include gauge ports at nozzles, and vent and drain ports. The volute shall be designed with a base ring matching an ANSI 125# flange that can be used for pump support.
10. Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Motors shall have heavy-duty grease lubricated ball bearings to offset the additional bearing loads associated with the closed-coupled pump design. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications.
11. Pumps shall conform to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.
12. Pump shall be of a maintainable design and for ease of maintenance should use machine fit parts and not press fit components.
13. Pump manufacturer shall be ISO-9001 certified.
14. Each pump shall be factory tested and name-plated before shipment.

D. Motor: Single speed and rigidly mounted to pump casing.

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. Refer to section 2.1, 2.2 and 2.3 for note specifications and requirements.

E. Quantities:

1. Two B&G Series 80 Pumps (P-7 & P-8) design capacity listed in datasheet located in specification section 232123A.
2. Two B&G Series 80 Pumps (P-9 & P-10) design capacity listed in datasheet located in specification section 232123A.

2.05 SEPARATELY COUPLED, BASE-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide ITT Corporation; Bell & Gossett or comparable product by one of the following:

1. Armstrong Pumps Inc.
2. ITT Corporation; Bell & Gossett.

3. TACO Incorporated.
 4. Approved Equal
- B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal.
- C. Pump Construction:
1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections.
 2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
 3. Pump Bearings: The motor bearings shall support the shaft via heavy-duty grease-lubricated ball bearings in cast-iron housing with grease fittings.
 4. The pumps shall be foot mounted, single stage, end suction case design, in cast iron bronze fitted construction specifically designed for quiet operation. Suitable standard operations at 225° F and 175 PSIG working pressure. The pump internals shall be capable of being serviced without disturbing piping connections.
 5. Pump shall be equipped with an internally flushed mechanical seal assembly installed in an enlarged tapered seal chamber. Seal assembly shall have a brass housing, Buna bellows and seat gasket, stainless steel spring, and be of a carbon ceramic design with the carbon face rotating against a stationary ceramic face.
 6. Pump shaft shall be made of stainless steel and connect to a brass impeller. Impeller shall be hydraulically and dynamically balanced, keyed to the shaft and secured by a stainless steel locking capscrew or nut.
 7. Pump should be designed to allow for true back pull-out access to the pump's working components for ease of maintenance.
 8. Pump volute shall be of a cast iron design for heating with integrally cast pedestal volute support, rated for 175 PSIG with integral cast iron flanges drilled for 125# ANSI companion flanges. Volute shall include gauge ports at nozzles, and vent and drain ports.
 9. Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Motors shall have heavy-duty grease lubricated ball bearings to offset the additional bearing loads associated with the decoupled pump design. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications.
 10. Pumps shall conform to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer. The pump NPSH shall conform to the ANSI/HI 9.6.1-1997 standards for Centrifugal and Vertical Pumps for NPSH Margin.
 11. Pump shall be of a maintainable design and for ease of maintenance should use machine fit parts and not press fit components.
 12. Pump manufacturer shall be ISO-9001 certified.
 13. Each pump shall be factory tested and name-plated before shipment.
- D. Shaft Coupling: Molded-rubber insert and interlocking spider capable of absorbing vibration. EPDM coupling sleeve for variable-speed applications.
- E. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.

- F. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.
- G. Motor: Single speed, secured to mounting frame, with adjustable alignment.
 - 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. Refer to section 2.1, 2.2, 2.3 for motor specifications and requirement.
- H. Quantities:
 - 1. Two B&G Series 1510-4AC Pumps (P-5 & P-6) design capacity listed in Datasheet located in Specification section 232123A

2.06 PUMP SPECIALTY FITTINGS

- A. Suction Diffuser (For use with end suction pumps):
 - 1. Size: Water pump Suction Size
 - 2. Angle pattern.
 - 3. 175-psig pressure rating, cast-iron body and end cap, pump-inlet fitting.
 - 4. Bronze startup and bronze or stainless-steel permanent strainers.
 - 5. Bronze or stainless-steel straightening vanes.
 - 6. Drain plug.
 - 7. Factory-fabricated support.
- B. Triple-Duty Valve:
 - 1. Size: Size for GPM
 - 2. Angle or straight pattern.
 - 3. 175-psig pressure rating, cast-iron body, pump-discharge fitting.
 - 4. Drain plug and bronze-fitted shutoff, balancing, and check valve features.
 - 5. Brass gage ports with integral check valve and orifice for flow measurement.

2.07 FIELD QUALITY CONTROL

- A. The manufacturer shall provide support to the installing contractor for performance of the following field testing. Allow for a minimum of 1 man-week of field support.

PART 3 - EXECUTION (FOR REFERENCE ONLY)

3.01 EXAMINATION

- A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.
- C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PUMP INSTALLATION

- A. Comply with HI 1.4.
- B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.
- C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.
- D. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.
- E. Equipment Mounting:
 - 1. Install base-mounted pumps on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in "Cast-in-Place Concrete."
 - 2. Comply with requirements for vibration isolation and seismic control devices specified in "Vibration and Seismic Controls for HVAC."
- F. Equipment Mounting: Install in-line pumps with continuous-thread hanger rods and elastomeric hangers of size required to support weight of in-line pumps.
 - 1. Comply with requirements for seismic-restraint devices specified in "Vibration and Seismic Controls for HVAC."
 - 2. Comply with requirements for hangers and supports specified in "Hangers and Supports for HVAC Piping and Equipment."

3.03 ALIGNMENT

- A. Engage a factory-authorized service representative to perform alignment service.
- B. Comply with requirements in Hydronics Institute standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.

- C. Comply with pump and coupling manufacturers' written instructions.
- D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.04 CONNECTIONS

- A. Where installing piping adjacent to pump, allow space for service and maintenance.
- B. Connect piping to pumps. Install valves that are same size as piping connected to pumps.
- C. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.
- D. Install triple-duty valve on discharge side of pumps.
- E. Install Y-type strainer, suction diffuser (for end-suction pumps) and shutoff valve on suction side of pumps.
- F. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.
- G. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.
- H. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- I. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.05 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Check piping connections for tightness.
 - 3. Clean strainers on suction piping.
 - 4. Perform the following startup checks for each pump before starting:
 - a. Verify bearing lubrication.
 - b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
 - c. Verify that pump is rotating in the correct direction.
 - 5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
 - 6. Start motor.

7. Open discharge valve slowly.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION 232123

STV Inc. New York, NY EQUIPMENT DATA SHEET	<h2 style="margin: 0;">ANSI Centrifugal Pumps</h2>	Tag: <u> P-5&6 </u> Rev: <u> A </u> Date: <u> 13-Aug-2014 </u>
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Client: <u> NJ DPMC </u>	By: <u> Evan Dubil </u>	Proj: <u> 3016769 </u>
Proj Name: <u> CRRNJ Terminal Building </u>	P&ID No: <u> - </u>	Doc: <u> Spec No. 232123A </u>
Location: <u> Liberty State Park </u>	RFQ No: <u> - </u>	Qty: <u> 2 </u>


1	rev	Service: <u> Hot Water Supply </u>	Room: <u> Boiler Room </u>
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PROCESS INFORMATION

5	General Information		rev	Pressures	
6	Design Flow:	<u> 440 </u> gpm		Discharge Pressure:	<u> </u> psig
7	Total Dynamic Head (TDH):	<u> 40.0 </u> feet		Suction Pressure:	<u> </u> psig
8	Duty:	<u> Continuous </u>		Differential Pressure:	<u> 0 </u> psi
9	Fluid Information			NPSH Available:	<u> * </u> feet
10	Fluid:	<u> Water </u>		* NPSH Required:	<u> 7.66 </u> feet
11	Pumping Temperature:	<u> 200 </u> deg F		* Max Shutoff Pressure:	<u> * </u> psig
12	Specific Gravity:	<u> * </u>		Flows	
13	Viscosity:	<u> * </u> cP		* Operating Flow:	<u> 440 </u> gpm
14	Weight Percent Solids:	<u> 0 </u> percent		* Minimum Flow:	<u> 102.5 </u> gpm
15	Max Particle Size:	<u> N/A </u> microns		Water Cooling	
16	Fluid Vapor Pressure:	<u> * </u> psia		Required:	<u> No </u>
17				Cooling Temp/Pressure:	<u> N/A deg F </u> <u> N/A </u> psig
18				Flow Required:	<u> N/A </u> gpm

MECHANICAL INFORMATION

21	General		rev	Shaft Seal	
22	* Manufacturer:	<u> Bell & Gossett </u>		Shaft Seal Type:	<u> Single Mechanical </u>
23	* Model:	<u> 1510-4AC </u>		Mechanical Seal Type:	<u> Pusher Type </u>
24	* Disch x Suct x Max Imp:	<u> 4 x 5 x 7 </u> inch		* Shaft Seal Location:	<u> Internal </u>
25	Pump Mounting:	<u> Foot Mounted </u>		* Seal Manufacturer:	<u> * </u>
26	* Casing Split:	<u> Radial </u>		* Seal Model:	<u> * </u>
27	* Number of Stages:	<u> One </u>		Balanced Seal:	<u> * </u>
28	* Pump Speed:	<u> 1750 </u> rpm		Auxiliary Packing Box:	<u> No </u>
29	* Pump / Motor Mounting:	<u> Coupled </u>		Floating Throttle Bushing:	<u> No </u>
30	* Bedplate Type:	<u> Fabricated Steel </u>		Gland Vent and Drain:	<u> No </u>
31	Rotation Facing Motor End:	<u> Clockwise </u>		Seal Chamber Type:	<u> * </u>
32				Seal Design:	<u> Cartridge </u>
33	Impeller / Casing			Connections	
34	* Impeller Type:	<u> * </u>		* Suction Size / Type:	<u> * </u> 150 lb ANSI FF Flg
35	* Impeller Dia. Furnished:	<u> 6.75 </u> inches		* Discharge Size / Type:	<u> * </u> 150 lb ANSI FF Flg
36	* Impeller Diameter Max:	<u> 7 </u> inches		Suction Gauge Size/Type:	<u> * </u> Not Applicable
37	* Casing Type:	<u> * </u>		Disch Gauge Size/Type:	<u> * </u> Not Applicable
38	Jacket Type:	<u> Not Applicable </u>		Casing Drain Size / Type:	<u> * </u> Not Applicable
39	* Design Temperature:	<u> 200 </u> deg F		Coupling	
40				* Coupling Manufacturer:	<u> * </u>
41	Seal Flush			* Coupling Model Number:	<u> * </u>
42	Seal Flush Fluid:	<u> Not Required </u>		* Coupling Type:	<u> Flexible </u>
43	Seal Flush Required:	<u> N/A gpm </u> <u> N/A </u> psig		* Cplg Guard Type:	<u> Spacer w/ OSHA Guard </u>
44	API Seal Flush Plan:	<u> </u>			
45					
46				* Lead Time:	<u> * </u> days
47					
48					
49					
50					

 STV Inc. New York, NY EQUIPMENT DATA SHEET	<h2 style="margin: 0;">ANSI Centrifugal Pumps</h2>	Tag: <u> P-5&6 </u> Rev: <u> A </u> Date: <u> 13-Aug-2014 </u>
Client: <u> NJ DPMC </u> Proj Name: <u> CRRNJ Terminal Building </u> Location: <u> Liberty State Park </u>	By: <u> Evan Dubil </u> P&ID No: <u> - </u> RFQ No: <u> - </u>	Proj: <u> 3016769 </u> Doc: <u> Spec No. 232123A </u> Qty: <u> 2 </u>
MATERIALS OF CONSTRUCTION / SURFACE FINISH		
Materials	rev	Seal Materials
51		
52	Casing: *	Rotating Face Inboard: <u> Tungsten Carbide </u>
53	Impeller: *	Stationary Face Inboard: <u> Carbon </u>
54	Shaft: <u> 316 SS </u>	Rotating Face Outboard: <u> * </u>
55	Shaft Sleeve: *	Stationary Face Outboard: <u> * </u>
56	Gland: *	Seal Housing: <u> 316 SS </u>
57	Coupling Guard: *	Seal Elastomers: <u> Buna N </u>
58	Baseplate / Supports: *	
59	Seal Pot: <u> Not Applicable </u>	
60		
61		
INCLUDED ACCESSORIES		
Seal Pot	rev	
62		
63	Seal Pot Capacity: <u> N/A </u> gallons	Seal Pot Press Gauge: <u> Not Applicable </u>
64		Pressure Gauge Mfr: <u> Not Applicable </u>
65	Seal Pot Accessories	Pressure Gauge Model: <u> Not Applicable </u>
66	Inlet, disch & drain valves: <u> Not Applicable </u>	Flush Line Accessories
67	Seal Pot Level Switch: <u> Not Applicable </u>	Seal Flush Piping Mat'l: <u> 316L SS </u>
68	Level Switch Mfr: <u> Not Applicable </u>	Seal Flush Needle Valve: <u> No </u>
69	Level Switch Model: <u> Not Applicable </u>	Rotameter: <u> No </u>
70	Seal Pot Level Gauge: <u> Not Applicable </u>	Other Accessories
71	Level Gauge Mfr: <u> Not Applicable </u>	Triple Duty Valve: <u> Yes </u>
72	Level Gauge Model: <u> Not Applicable </u>	Suction Diffuser: <u> Yes </u>
73		
74		
ELECTRICAL		
General Information	rev	Motor Information
75		
76	NEC Area: *	* Motor Manufacturer: <u> * </u>
77	Additional NEC Area: *	* Motor Model Number: <u> * </u>
78	Power Supplied: <u> 480 V / 3 ph / 60 Hz </u>	* Severe Duty: <u> Yes </u>
79	* Power Draw: <u> 9.2 </u> amps	* Energy Efficient: <u> Yes </u>
80	Hydraulic Power: <u> * </u> hhp	* Inverter Duty: <u> Yes </u>
81	* Design Pump Efficiency: <u> 83.05 </u> percent	* Washdown Duty: <u> * </u>
82	* Brake Power @ Design Eff: <u> 4.06 </u> bhp	* Motor Enclosure: <u> * </u>
83	* End of Curve Brake Power: <u> 4.72 </u> bhp	Motor Design Code: <u> NEMA </u>
84		* Motor Power: <u> 7-1/2 </u> hp
85	Variable Speed Drive	* Motor Frame Size: <u> 213T </u> TC
86	VFD Required: <u> Yes </u>	* Motor Speed: <u> * </u> rpm
87	VFD Manufacturer: <u> * </u>	Motor Starter: <u> By Buyer </u>
88	VFD Model: <u> * </u>	Motor Starter Size: <u> * </u>
89	VFD Turndown: <u> * </u>	
90		
91		
WEIGHTS AND DIMENSIONS		
Weights	rev	Overall Dimensions
92		
93	* Pump, Base & Motor: <u> * </u> lbs	* Width x Depth x Length: <u> * x * x * </u> inch
94		
95		
NOTES		
96		
97	<input type="checkbox"/>	
98	<input type="checkbox"/>	
99	<input type="checkbox"/>	
100		

Client: <u> NJ DPMC </u>	By: <u> Evan Dubil </u>	Proj: <u> 3016769 </u>
Proj Name: <u> CRRNJ Terminal Building </u>	P&ID No: <u> - </u>	Doc: <u> Spec No. 232123A </u>
Location: <u> Liberty State Park </u>	RFQ No: <u> - </u>	Qty: <u> 2 </u>

1	rev	Service: <u> 30% Propylene Glycol Hot Water Supply </u>	Room: <u> Boiler Room </u>
2			
3			

PROCESS INFORMATION

5	<i>General Information</i>	rev	<i>Pressures</i>
6	Design Flow: <u> 100 </u> gpm		Discharge Pressure: <u> </u> psig
7	Total Dynamic Head (TDH): <u> 40.0 </u> feet		Suction Pressure: <u> </u> psig
8	Duty: <u> Continuous </u>		Differential Pressure: <u> 0 </u> psi
9	<i>Fluid Information</i>		NPSH Available: <u> * </u> feet
10	Fluid: <u> 30% Propylene Glycol </u>		* NPSH Required: <u> 3.9 </u> feet
11	Pumping Temperature: <u> 180 </u> deg F		* Max Shutoff Pressure: <u> * </u> psig
12	Specific Gravity: <u> * </u>		<i>Flows</i>
13	Viscosity: <u> * </u> cP		* Operating Flow: <u> 100 </u> gpm
14	Weight Percent Solids: <u> 0 </u> percent		* Minimum Flow: <u> 19 </u> gpm
15	Max Particle Size: <u> N/A </u> microns		<i>Water Cooling</i>
16	Fluid Vapor Pressure: <u> * </u> psia		Required: <u> No </u>
17			Cooling Temp/Pressure: <u> N/A </u> deg F <u> N/A </u> psig
18			Flow Required: <u> N/A </u> gpm
19			

MECHANICAL INFORMATION

21	<i>General</i>	rev	<i>Shaft Seal</i>
22	* Manufacturer: <u> Bell & Gossett </u>		Shaft Seal Type: <u> Single Mechanical </u>
23	* Model: <u> Series 80 </u>		Mechanical Seal Type: <u> Pusher Type </u>
24	* Disch x Suct x Max Imp: <u> 2.5 x 2.5 x 7 </u> inch		* Shaft Seal Location: <u> Internal </u>
25	Pump Mounting: <u> Inline </u>		* Seal Manufacturer: <u> * </u>
26	* Casing Split: <u> Radial </u>		* Seal Model: <u> * </u>
27	* Number of Stages: <u> One </u>		Balanced Seal: <u> * </u>
28	* Pump Speed: <u> 1750 </u> rpm		Auxiliary Packing Box: <u> No </u>
29	* Pump / Motor Mounting: <u> Close Coupled </u>		Floating Throttle Bushing: <u> No </u>
30	* Bedplate Type: <u> * </u>		Gland Vent and Drain: <u> No </u>
31	Rotation Facing Motor End: <u> * </u>		Seal Chamber Type: <u> * </u>
32			Seal Design: <u> Cartridge </u>
33	<i>Impeller / Casing</i>		<i>Connections</i>
34	* Impeller Type: <u> * </u>		* Suction Size / Type: <u> * </u> 150 lb ANSI FF Flg
35	* Impeller Dia. Furnished: <u> 6.75 </u> inches		* Discharge Size / Type: <u> * </u> 150 lb ANSI FF Flg
36	* Impeller Diameter Max: <u> 7 </u> inches		Suction Gauge Size/Type: <u> * </u> Not Applicable
37	* Casing Type: <u> * </u>		Disch Gauge Size/Type: <u> * </u> Not Applicable
38	Jacket Type: <u> Not Applicable </u>		Casing Drain Size / Type: <u> * </u> Not Applicable
39	* Design Temperature: <u> 200 </u> deg F		<i>Coupling</i>
40			* Coupling Manufacturer: <u> * </u>
41	<i>Seal Flush</i>		* Coupling Model Number: <u> * </u>
42	Seal Flush Fluid: <u> Not Required </u>		* Coupling Type: <u> Flexible </u>
43	Seal Flush Required: <u> N/A </u> gpm <u> N/A </u> psig		* Cplg Guard Type: <u> Spacer w/ OSHA Guard </u>
44	API Seal Flush Plan: <u> </u>		
45			* Lead Time: <u> * </u> days
46			
47			
48			
49			
50			

STV Inc. New York, NY EQUIPMENT DATA SHEET	<h2 style="margin: 0;">ANSI Centrifugal Pumps</h2>	Tag: <u> P-7&8 </u> Rev: <u> A </u> Date: <u> 13-Aug-2014 </u>
Client: <u> NJ DPMC </u> Proj Name: <u> CRRNJ Terminal Building </u> Location: <u> Liberty State Park </u>	By: <u> Evan Dubil </u> P&ID No: <u> - </u> RFQ No: <u> - </u>	Proj: <u> 3016769 </u> Doc: <u> Spec No. 232123A </u> Qty: <u> 2 </u>
MATERIALS OF CONSTRUCTION / SURFACE FINISH		
Materials	rev	Seal Materials
51		
52	Casing: *	Rotating Face Inboard: <u> Tungsten Carbide </u>
53	Impeller: *	Stationary Face Inboard: <u> Carbon </u>
54	Shaft: <u> 316 SS </u>	Rotating Face Outboard: <u> * </u>
55	Shaft Sleeve: *	Stationary Face Outboard: <u> * </u>
56	Gland: *	Seal Housing: <u> 316 SS </u>
57	Coupling Guard: *	Seal Elastomers: <u> Buna N </u>
58	Baseplate / Supports: *	
59	Seal Pot: <u> Not Applicable </u>	
60		
61		
INCLUDED ACCESSORIES		
Seal Pot	rev	
62		
63	Seal Pot Capacity: <u> NIA </u> gallons	Seal Pot Press Gauge: <u> Not Applicable </u>
64		Pressure Gauge Mfr: <u> Not Applicable </u>
65		Pressure Gauge Model: <u> Not Applicable </u>
66	Seal Pot Accessories	Flush Line Accessories
67	Inlet, disch & drain valves: <u> Not Applicable </u>	Seal Flush Piping Mat'l: <u> 316L SS </u>
68	Seal Pot Level Switch: <u> Not Applicable </u>	Seal Flush Needle Valve: <u> No </u>
69	Level Switch Mfr: <u> Not Applicable </u>	Rotameter: <u> No </u>
70	Level Switch Model: <u> Not Applicable </u>	
71	Seal Pot Level Gauge: <u> Not Applicable </u>	Other Accessories
72	Level Gauge Mfr: <u> Not Applicable </u>	Triple Duty Valve: <u> Yes </u>
73	Level Gauge Model: <u> Not Applicable </u>	Suction Diffuser: <u> No </u>
74		
ELECTRICAL		
General Information	rev	Motor Information
75		
76	NEC Area: *	* Motor Manufacturer: <u> * </u>
77	Additional NEC Area: *	* Motor Model Number: <u> * </u>
78	Power Supplied: <u> 480 V / 3 ph / 60 Hz </u>	* Severe Duty: <u> Yes </u>
79	* Power Draw: <u> 4 </u> amps	* Energy Efficient: <u> Yes </u>
80	Hydraulic Power: <u> * </u> hhp	* Inverter Duty: <u> Yes </u>
81	* Design Pump Efficiency: <u> 67.03 </u> percent	* Washdown Duty: <u> * </u>
82	* Brake Power @ Design Eff: <u> 1.55 </u> bhp	* Motor Enclosure: <u> * </u>
83	* End of Curve Brake Power: <u> 2.01 </u> bhp	Motor Design Code: <u> NEMA </u>
84		* Motor Power: <u> 3 </u> hp
85		* Motor Frame Size: <u> 182J </u> TC
86	Variable Speed Drive	* Motor Speed: <u> * </u> rpm
87	VFD Required: <u> Yes </u>	Motor Starter: <u> By Buyer </u>
88	VFD Manufacturer: <u> * </u>	Motor Starter Size: <u> * </u>
89	VFD Model: <u> * </u>	
90	VFD Turndown: <u> * </u>	
91		
WEIGHTS AND DIMENSIONS		
Weights	rev	Overall Dimensions
92		
93	* Pump, Base & Motor: <u> * </u> lbs	* Width x Depth x Length: <u> * x * x * </u> inch
94		
95		
NOTES		
96		
97	<input type="checkbox"/>	
98	<input type="checkbox"/>	
99	<input type="checkbox"/>	
100		

STV Inc. New York, NY EQUIPMENT DATA SHEET	<h2 style="margin: 0;">ANSI Centrifugal Pumps</h2>	Tag: <u> P-9&10 </u> Rev: <u> A </u> Date: <u> 13-Aug-2014 </u>
Client: <u> NJ DPMC </u> Proj Name: <u> CRRNJ Terminal Building </u> Location: <u> Liberty State Park </u>	By: <u> Evan Dubil </u> P&ID No: <u> - </u> RFQ No: <u> - </u>	Proj: <u> 3016769 </u> Doc: <u> Spec No. 232123A </u> Qty: <u> 2 </u>
1 rev	Service: <u> Hot Water Return </u>	Room: <u> Boiler Room </u>
2	PROCESS INFORMATION	
3		
4	General Information	
5	Design Flow: <u> 90 </u> gpm Total Dynamic Head (TDH): <u> 40.0 </u> feet Duty: <u> Continuous </u> Fluid Information Fluid: <u> Water </u> Pumping Temperature: <u> 200 </u> deg F Specific Gravity: <u> * </u> Viscosity: <u> * </u> cP Weight Percent Solids: <u> 0 </u> percent Max Particle Size: <u> N/A </u> microns Fluid Vapor Pressure: <u> * </u> psia	Pressures Discharge Pressure: <u> </u> psig Suction Pressure: <u> </u> psig Differential Pressure: <u> 0 </u> psi NPSH Available: <u> * </u> feet * NPSH Required: <u> 7.55 </u> feet * Max Shutoff Pressure: <u> * </u> psig Flows * Operating Flow: <u> 90 </u> gpm * Minimum Flow: <u> 17.1 </u> gpm Water Cooling Required: <u> No </u> Cooling Temp/Pressure: <u> N/A </u> deg F <u> N/A </u> psig Flow Required: <u> N/A </u> gpm
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20	MECHANICAL INFORMATION	
21	General	
22	* Manufacturer: <u> Bell & Gossett </u> * Model: <u> Series e90 2AAC </u> * Disch x Suct x Max Imp: <u> 2 x 2 x 5.25 </u> inch Pump Mounting: <u> Inline </u> * Casing Split: <u> Radial </u> * Number of Stages: <u> One </u> * Pump Speed: <u> 1750 </u> rpm * Pump / Motor Mounting: <u> Close Coupled </u> * Bedplate Type: <u> * </u> Rotation Facing Motor End: <u> * </u>	Shaft Seal Shaft Seal Type: <u> Single Mechanical </u> Mechanical Seal Type: <u> Pusher Type </u> * Shaft Seal Location: <u> Internal </u> * Seal Manufacturer: <u> * </u> * Seal Model: <u> * </u> Balanced Seal: <u> * </u> Auxiliary Packing Box: <u> No </u> Floating Throttle Bushing: <u> No </u> Gland Vent and Drain: <u> No </u> Seal Chamber Type: <u> * </u> Seal Design: <u> Cartridge </u>
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33	Impeller / Casing	
34	* Impeller Type: <u> * </u> * Impeller Dia. Furnished: <u> 3.625 </u> inches * Impeller Diameter Max: <u> 5.25 </u> inches * Casing Type: <u> * </u> Jacket Type: <u> Not Applicable </u> * Design Temperature: <u> 200 </u> deg F	Connections * Suction Size / Type: <u> * </u> 150 lb ANSI FF Flg * Discharge Size / Type: <u> * </u> 150 lb ANSI FF Flg Suction Gauge Size/Type: <u> * </u> Not Applicable Disch Gauge Size/Type: <u> * </u> Not Applicable Casing Drain Size / Type: <u> * </u> Not Applicable Coupling * Coupling Manufacturer: <u> * </u> * Coupling Model Number: <u> * </u> * Coupling Type: <u> Flexible </u> * Cplg Guard Type: <u> Spacer w/ OSHA Guard </u> * Lead Time: <u> * </u> days
35		
36		
37		
38		
39		
40		
41	Seal Flush	
42	Seal Flush Fluid: <u> Not Required </u> Seal Flush Required: <u> N/A </u> gpm <u> N/A </u> psig API Seal Flush Plan: <u> </u>	
43		
44		
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49		
50		

STV Inc. New York, NY EQUIPMENT DATA SHEET	<h2 style="margin: 0;">ANSI Centrifugal Pumps</h2>	Tag: <u> P-9&10 </u> Rev: <u> A </u> Date: <u> 13-Aug-2014 </u>
Client: <u> NJ DPMC </u> Proj Name: <u> CRRNJ Terminal Building </u> Location: <u> Liberty State Park </u>	By: <u> Evan Dubil </u> P&ID No: <u> - </u> RFQ No: <u> - </u>	Proj: <u> 3016769 </u> Doc: <u> Spec No. 232123A </u> Qty: <u> 2 </u>
MATERIALS OF CONSTRUCTION / SURFACE FINISH		
Materials	rev	Seal Materials
51		
52	Casing: *	Rotating Face Inboard: <u> Tungsten Carbide </u>
53	Impeller: *	Stationary Face Inboard: <u> Carbon </u>
54	Shaft: <u> 316 SS </u>	Rotating Face Outboard: <u> * </u>
55	Shaft Sleeve: *	Stationary Face Outboard: <u> * </u>
56	Gland: *	Seal Housing: <u> 316 SS </u>
57	Coupling Guard: *	Seal Elastomers: <u> Buna N </u>
58	Baseplate / Supports: *	
59	Seal Pot: <u> Not Applicable </u>	
60		
61		
INCLUDED ACCESSORIES		
Seal Pot	rev	
62		
63	Seal Pot Capacity: <u> N/A </u> gallons	Seal Pot Press Gauge: <u> Not Applicable </u>
64		Pressure Gauge Mfr: <u> Not Applicable </u>
65		Pressure Gauge Model: <u> Not Applicable </u>
66	Seal Pot Accessories	Flush Line Accessories
67	Inlet, disch & drain valves: <u> Not Applicable </u>	Seal Flush Piping Mat'l: <u> 316L SS </u>
68	Seal Pot Level Switch: <u> Not Applicable </u>	Seal Flush Needle Valve: <u> No </u>
69	Level Switch Mfr: <u> Not Applicable </u>	Rotameter: <u> No </u>
70	Level Switch Model: <u> Not Applicable </u>	
71	Seal Pot Level Gauge: <u> Not Applicable </u>	Other Accessories
72	Level Gauge Mfr: <u> Not Applicable </u>	Triple Duty Valve: <u> Yes </u>
73	Level Gauge Model: <u> Not Applicable </u>	Suction Diffuser: <u> No </u>
74		
75		
ELECTRICAL		
General Information	rev	Motor Information
76		
77	NEC Area: *	* Motor Manufacturer: <u> * </u>
78	Additional NEC Area: *	* Motor Model Number: <u> * </u>
79	Power Supplied: <u> 480 V / 3 ph / 60 Hz </u>	* Severe Duty: <u> Yes </u>
80	* Power Draw: <u> 2.5 </u> amps	* Energy Efficient: <u> Yes </u>
81	Hydraulic Power: <u> * </u> hhp	* Inverter Duty: <u> Yes </u>
82	* Design Pump Efficiency: <u> 73.15 </u> percent	* Washdown Duty: <u> * </u>
83	* Brake Power @ Design Eff: <u> 1.28 </u> bhp	* Motor Enclosure: <u> * </u>
84	* End of Curve Brake Power: <u> 1.12 </u> bhp	Motor Design Code: <u> NEMA </u>
85		* Motor Power: <u> 2 </u> hp
86	Variable Speed Drive	* Motor Frame Size: <u> 145T </u> TC
87	VFD Required: <u> Yes </u>	* Motor Speed: <u> * </u> rpm
88	VFD Manufacturer: <u> * </u>	Motor Starter: <u> By Buyer </u>
89	VFD Model: <u> * </u>	Motor Starter Size: <u> * </u>
90	VFD Turndown: <u> * </u>	
91		
WEIGHTS AND DIMENSIONS		
Weights	rev	Overall Dimensions
92		
93	* Pump, Base & Motor: <u> * </u> lbs	* Width x Depth x Length: <u> * x * x * </u> inch
94		
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NOTES		
96		
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99	<input type="checkbox"/>	
100		

SECTION 235216 - CONDENSING BOILERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

- A. Section includes packaged, factory-fabricated and -assembled, gas-fired, fire-tube condensing boilers, trim, and accessories for generating hot water.

1.03 DEFINITIONS

- A. IRI: Industrial Risk Insurers.

1.04 SUBMITTALS

- A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.
- B. Operation and Maintenance Data: For boilers to include in emergency, operation, and maintenance manuals.
- C. Wiring Diagrams: Power, signal and control wiring.
- D. Quantities in accordance with Division 1 requirements.
- E. Source quality-control reports.
- F. Warranty: Special warranty specified in this Section.
- G. Other Informational Submittals:
 - 1. ASME Stamp Certification and Report: Submit "A," "S," or "PP" stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler.

1.05 QUALITY ASSURANCE

- A. 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.

- B. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.
- C. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."
- D. UL Compliance: Test boilers for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

1.06 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.
 - 1. As part of bid, provide additional cost to extend standard warranty to 5 years from date of substantial completion.
 - 2. Warranty Period for Other Fire-Tube Condensing Boiler Components:
 - a. Leakage and Materials: 10 years from date of Substantial Completion.
 - b. Heat Exchanger Damaged by Thermal Stress and Corrosion: Nonprorated for 10 years from date of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment with protective crating and covering.
- B. Store equipment to prevent damage and protect from weather, dirt, fumes, water, and construction debris until final delivery date to the construction site.

PART 2 - PRODUCTS

2.01 FIRE-TUBE CONDENSING BOILERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Basis of Design product or comparable product by one of the following:
 - 1. AERCO International, Model: BMK-3000
 - 2. Cleaver Brooks, Model: ClearFire-C 3300
 - 3. Lochinvar, Model: FBN3500
 - 4. Or Approved Equal
- B. Description: Factory-fabricated, -assembled, and -tested, fire-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls. Water heating service only.

- C. Heat Exchanger: Stainless steel, corrosion-resistant combustion chamber. The heat exchanger shall be designed to prevent fluid boiling.
- D. All surfaces exposed to condensed flue gas shall be constructed of stainless steel.
- E. Pressure Vessel: Carbon steel with welded heads and tube connections.
- F. Burner: Natural gas, forced draft.
- G. Blower: Centrifugal fan to operate during each burner firing sequence and to prepurge and postpurge the combustion chamber.
 - 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.
- H. Gas Train: Combination gas valve with manual shutoff and pressure regulator. Gas train shall be IRI compliant.
- I. Ignition: Spark ignition with 100 percent main-valve shutoff with electronic flame supervision.
- J. Casing:
 - 1. Jacket: Sheet metal, with snap-in or interlocking closures.
 - 2. Control Compartment Enclosures: NEMA 250, Type 12.
 - 3. Finish: Powder-coated protective finish.
 - 4. Insulation: Minimum 2-inch-thick, mineral-fiber insulation surrounding the heat exchanger.
 - 5. Combustion-Air Connections: Inlet and vent duct collars.
 - 6. Mounting base to secure boiler.
- K. Boiler Fuel Burning System:
 - 1. The boiler manufacturer shall furnish each boiler with an integral, power type, straight gas, fully automatic fuel burner. The fuel burner shall be an assembly of gas burner, combustion air blower, gas valve train, and ignition system. The burner manufacturer shall fully coordinate the burner as to the interaction of its elements with the boiler heat exchanger and the boiler control system in order to provide the required capacities, efficiencies, and performance as specified.
 - 2. Each burner shall be provided with an integral gas firing combustion head.
 - 3. Each burner shall provide adequate turbulence and mixing to achieve proper combustion without producing smoke or producing combustibles in the flue gases.
 - 4. Each burner shall be provided with an integral variable speed power blower or Direct Coupled Actuators (Honeywell ML7999 or approved equal). The burner assembly shall have sufficient capacity at the rated firing rate to provide air for stoichiometric combustion plus the necessary excess air. Static and total pressure capability shall comply with the requirements of the boiler. The blower shall operate without undue

vibration and noise and shall be designed and constructed for exposure to temperatures normal to its location on the boiler.

5. Each boiler shall be provided with a full-modulating (parallel-positioning linkage-less or common shaft linkage-less) firing control system whereby the firing rate is infinitely proportional at any firing rate between 33% and 100% as determined by the modulating input control signal. Both fuel input and air input must be sequenced in unison to the appropriate firing rate without the use of mechanical linkage. Provide linkage-less burner control system complete with digital fuel/air controller (Honeywell R7999 or approved equal), fuel/air controller sub-base (Honeywell Q7999A or approved equal), and Universal Parallel Positioning Actuators (Direct Coupled Actuators – Honeywell ML7999 or approved equal) for all gas fuel valves and combustion air damper (or provide variable speed blower).
6. The Direct Digital Control (DDC) microprocessors shall use a Proportional Integral Algorithm to determine the firing rate. The controllers must have the following selectable capabilities:
 - a. Maintain single set point mode.
 - b. Reset the set point based on outdoor air temperature mode.
 - c. Boiler shutdown based on outdoor air temperature.
 - d. Alarm relay for any for any manual reset alarm function.
 - e. Programmable Low Fire Delay to prevent short cycling based on a time and temperature factor for release to modulation.
 - f. LED-Display showing current status and supply temperatures, run hours, current set points as well as differential set points. It shall also display any fault codes whether automatically reset or manually reset.
 - g. Local Manual Operation.

L. Gas Valve Train

1. Each boiler shall be provided with an integral IRI compliant gas valve train. The gas valve train shall be factory assembled, piped, and wired. Each gas valve train shall include at least the following:
 - a. Two (2) manual shutoff valves on the main gas train (one for the inlet connection and one for the outlet connection) and one inlet pilot manual shutoff valve.
 - b. Two (2) safety shutoff valves on both the pilot train and the main train. Valves shall be equipped with dual-solenoids that can be independently energized for leak testing.
 - c. Air-Gas ratio control (max. inlet pressure 14" w.c.)
 - d. One (1) low gas pressure switch (manual reset) on each of the pilot and main gas trains.
 - e. One (1) high gas pressure switch (manual reset) on the main gas train.
 - f. Two (2) pressure test ports on the main train and one pressure test port on the pilot train.
 - g. One main gas regulator and one pilot gas regulator.
2. A UL listed valve proving system may be substituted for the normally open vent valve. The valve proving system shall be wired to operate on a call for startup locking out the burner prior to pilot ignition and/or after burner shutdown if an internal gas valve leak is

detected. Wiring diagrams of the valve proving system shall be included with the burner submittal package.

M. Ignition System

1. Each boiler shall be equipped for direct spark ignition.

N. Combustion Air Control System

1. Each boiler shall be provided with an integral combustion air control system. The combustion air system shall be factory assembled. Each combustion air control system shall include at least the following:
 - a. The primary control shall vary the speed of the combustion air blower or throttle the combustion air Direct Coupled Actuators (Honeywell ML7999 or approved equal) based on load demand. The variable speed blower (if used) shall supply a varying negative pressure on the gas valve which will open or close to maintain zero pressure at the valve orifice, thereby increasing or decreasing the firing rate. Both the air and gas shall be premixed in the blower.
 - b. One (1) low airflow differential pressure switch to insure that combustion air is supplied.
 - c. High exhaust back pressure switch
 - d. Provide control of either supply air fan or combustion dampers and integration of proof of operation of open-damper into the burner's start circuit.

O. Burner Control System

1. The control system shall be supplied with a 24 Vac transformer (120 Vac, single phase, 60 hertz primary).
2. The boiler shall include an electric spark ignition system. Main flame shall be monitored and controlled by flame rectification system.
3. Each boiler shall be provided with all necessary controls, all necessary programming sequences, and all safety interlocks. Each boiler control system shall be properly interlocked with all safeties.
4. Each boiler control system shall provide timed sequence pre-ignition air purge of boiler combustion chamber. The combustion airflow sensor shall monitor and prove the airflow purge.

P. Burner – General:

1. The burner shall be constructed as a power burner design. The burner shall be comprised of blower assembly, firing head, ignition hardware, and flame safeguard. The burner shall be easily removed for maintenance without the disruption of any other major component of the boiler.

Q. Ignition Hardware:

1. The ignition hardware shall consist of insulated ignition electrodes and UV sensing tube permanently arranged to ensure proper ignition electrode and UV alignment.
- R. Fuel:
1. The boiler shall be suitable for firing with natural gas utilizing a Category IV forced-air combustion system.
- S. Required Gas Pressure:
1. The boiler shall be capable of operating at rated capacity with gas pressures between 4.0" W.G. to 14.0" W.G. at the inlet to the burner pressure regulator.
- T. Boiler Features:
1. The burner shall be provided with the following features and trim:
 - a. Burner Firing: Full modulation with minimum 15:1 turndown.
 - b. Burner Ignition: Intermittent proven pilot interrupted spark ignition system.
 - c. Gas Train: IRI compliant configured for burner size.
 - d. Safety Devices: Low gas pressure switches, air-flow switch, low-water cutout sensors, manual reset high limit and blocked flue detection switch.
- U. Quantities:
1. Two (2) BMK-3000 Condensing Boilers design capacity listed in datasheet located in specification section 235216A.

2.02 TRIM

- A. Aquastat Controllers: Operating and high limit.
- B. Safety Relief Valve: ASME rated.
- C. Pressure and Temperature Gage: Minimum 3-1/2-inch-diameter, combination water-pressure and -temperature gage. Gages shall have operating-pressure and -temperature ranges so normal operating range is about 50 percent of full range.
- D. Boiler Air Vent: Automatic.
- E. Drain Valve: Minimum NPS 3/4 hose-end gate valve.
- F. Corrosion resistant condensate drain fabricated of stainless steel and an accessible condensate trap.
- G. Low air pressure switch.
- H. Blocked flue detection switch or forced draft fan failure interlock.
- I. Condensate Neutralization Kit

2.03 CONTROLS

A. Boiler operating controls shall include the following devices and features at a minimum:

1. Control transformer.
2. LED display showing current supply and return temperature, current set points as well as differential set points. It shall also display any fault codes whether automatically reset or manually reset.
3. Set-Point Adjust: Set points shall be adjustable.
4. Operating Pressure Control: Factory wired and mounted to cycle burner.
5. Sequence of Operation: Electric, factory-fabricated and field-installed panel to control burner firing rate to maintain supply water temperature.
6. The DDC microprocessors shall use a proportional integral algorithm to determine the firing rate.
7. Sequence of Operation: Electric, factory-fabricated and field-installed panel to control burner firing rate to reset supply-water temperature inversely with outside-air temperature. At 20 deg F outside-air temperature, set supply-water temperature at 200 deg F; at 60 deg F (adj.) outside-air temperature, set supply-water temperature at 120 deg F (adj).
 - a. Include automatic, alternating-firing sequence for multiple boilers to ensure maximum system efficiency throughout the load range and to provide equal runtime for boilers.

B. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.

1. High Cutoff: Automatic reset stops burner if operating conditions rise above maximum boiler design pressure.
2. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manual-reset type.
3. Blocked Inlet Safety Switch: Manual-reset pressure switch field mounted on boiler combustion-air inlet.
4. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.

C. Building Automation System Interface: Factory install hardware and software to enable building automation system to monitor, control, and display boiler status and alarms.

1. A communication interface with building automation system shall enable building automation system operator to remotely control and monitor the boiler from an operator workstation. Control features available, and monitoring points displayed, locally at boiler control panel shall be available through building automation system.
2. Provide boiler control system panel. Basis of design: AERCO Control System (ACS)
3. Provide boiler communication gateway. Gateway is required to communicate with JCI Metasys N2 building automation system and shall be compatible with BACnet. Basis of Design: AERCO ProtoNode Gateway

2.04 ELECTRICAL POWER

- A. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.
 - 1. House in NEMA 250, Type 12 enclosure.
 - 2. Wiring shall be numbered and color-coded to match wiring diagram.
 - 3. Install factory wiring outside of an enclosure in a metal raceway.
 - 4. Provide branch power circuit to each motor and to controls with a disconnect switch or circuit breaker.
 - 5. Provide each motor with overcurrent protection.

2.05 SOURCE QUALITY CONTROL

- A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.
- B. Submit operating instruction manuals, complete with schematic wiring and diagram for the boiler/burner units, all combustion and operating controls and maintenance data.
- C. Provide factory inspection report prior to shipping along with all the tests performed at the factory.
- D. Submit factory certified prototype test report for combustion efficiency.
- E. Submit UL listing.
- F. Provide a set of manufacturer's guarantees for each boiler/burner.
- G. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code Section IV.

2.06 FIELD QUALITY CONTROL

- A. The manufacturer shall provide support to the installing contractor for performance of the following field testing. Allow for a minimum of 2 man-weeks of field support.

PART 3 - EXECUTION (FOR REFERENCE ONLY)

3.01 EXAMINATION

- A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.

1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
- B. Examine mechanical spaces for suitable conditions where boilers will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 BOILER INSTALLATION

- A. Equipment Mounting:
 1. Install boilers on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
 2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Install gas-fired boilers according to NFPA 54.
- C. Assemble and install boiler trim.
- D. Install electrical devices furnished with boiler but not specified to be factory mounted.
- E. Install control wiring to field-mounted electrical devices.

3.03 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to boiler to allow service and maintenance.
- C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.
- D. Connect piping to boilers, except safety relief valve connections, with flexible connectors of materials suitable for service. Flexible connectors and their installation are specified in Section 232116 Hydronic Piping Specialties."
- E. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas train connection. Provide a reducer if required.
- F. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.
- G. Install piping from safety relief valves to nearest floor drain.
- H. Install piping from safety valves to drip-pan elbow and to nearest floor drain.
- I. Boiler Venting:

1. Install flue venting kit and combustion-air intake.
 2. Connect full size to boiler connections. Comply with requirements in Section 235100 "Breechings, Chimneys, and Stacks."
- J. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- K. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.04 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:
1. Perform installation and startup checks according to manufacturer's written instructions.
 2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
 3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
 - b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.
- F. 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.
- G. Performance Tests:
1. Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.
 2. Boilers shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.
 3. Perform field performance tests to determine capacity and efficiency of boilers.
 - a. Test for full capacity.
 - b. Test for boiler efficiency at low fire 20, 40, 60, 80, 100, 80, 60, 40, and 20 percent of full capacity. Determine efficiency at each test point.

4. Repeat tests until results comply with requirements indicated.
5. Provide analysis equipment required to determine performance.
6. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are not adequate.
7. Notify Architect in advance of test dates.
8. Document test results in a report and submit to Architect.

3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 235216

STV Inc. New York, NY EQUIPMENT DATA SHEET	Fire Tube Condensing Boiler System	Tag: <u> B-1&2 </u> Rev: <u> A </u> Date: <u> 14-Aug-2014 </u>
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Client: <u> NJ DPMC </u> Proj Name: <u> CRRNJ Terminal Building </u> Location: <u> Liberty State Park </u>	By: <u> Evan Dubil </u> P&ID No: <u> - </u> RFQ No: <u> - </u>	Proj: <u> 3016769 </u> Doc: <u> Spec No. 235216A </u> Qty: <u> 2 </u>
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1	rev	Service: <u> Central Hot Water System </u>	Room: <u> </u>
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PROCESS INFORMATION

5	rev			Inlet Flows
6		Rated Continuous Capacity: <u> 2610 </u>	MBH	Combustion Air Flow: <u> * </u> acfm
7		Maximum Operating Pressure: <u> </u>		Combustion Gas Flow: <u> * </u> lbs/hr
8		<u> 160 </u>	psig	Excess Air (Natural Gas): <u> * </u> percent
9				Excess Air (Oil): <u> * </u> percent
10		Temperatures		
11		* Boiler Exit (Natural Gas): <u> * </u>	deg F	Flue Gas Exit Temp: <u> * </u> deg F
12		Boiler Exit (Oil): <u> </u>	deg F	Furnace Heat Release: <u> * </u> btu/cuft/hr
13		* Combustion Air: <u> 0 </u>	deg F	Turndown Ratio: (Gas/Oil) <u> 15:1 </u> /
14		Economizer Exit (Natural Gas): <u> </u>	deg F	Boiler Feed Water Type: <u> Softened Water </u>
15				Boiler Ignition: <u> Electric </u>
16		Feed Water Inlet <u> 40 </u>	deg F	
17		Furnace Exit (Natural Gas): <u> </u>	deg F	
18		Furnace Exit (Oil): <u> </u>	deg F	
19		Entering Water <u> 180 </u>	deg F	
20		Leaving Water <u> 200 </u>	deg F	
21				
22		Inlet Pressures		
23		Number 2 Oil Range: <u> </u>	psig	
24		* Natural Gas Range: <u> 4" - 14" </u>	in W.C.	
25				
26				
27				
28				
29				

29	Natural Gas Composition				
30	Source: <u> Pipeline </u>			Natural Gas Emission Guarantees	
31	Natural Gas Efficiency			* NOx: <u> * </u>	lbs/day
32	* 25 Percent Capacity: <u> * </u>	percent		* CO: <u> * </u>	lbs/day
33	* 50 Percent Capacity: <u> * </u>	percent		* SOx: <u> * </u>	lbs/day
34	* 75 Percent Capacity: <u> * </u>	percent		* Particulate: <u> * </u>	lbs/day
35	* 100 Percent Capacity: <u> * </u>	percent		* Forced Gas Recirculation: <u> * </u>	percent
36					
37					

MECHANICAL INFORMATION

39	rev	Hot Water Boiler		Heating Surface
40		* Manufacturer: <u> AERCO </u>		* ASME Radiant: <u> * </u> sqft
41		* Model: <u> BMK-3000 </u>		* Convection: <u> * </u> sqft
42				* Total ASME Effective: <u> * </u> sqft
43		Low NOx Burner		
44		* Manufacturer: <u> * </u>		
45		* Model: <u> * </u>		* Lead Time: <u> * </u> days
46				
47				
48				

BOILER DESIGN

50	
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STV Inc. New York, NY EQUIPMENT DATA SHEET	Fire Tube Condensing Boiler System	Tag: <u> B-1&2 </u> Rev: <u> A </u> Date: <u> 14-Aug-2014 </u>
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Client: <u> NJ DPMC </u> Proj Name: <u> CRRNJ Terminal Building </u> Location: <u> Liberty State Park </u>	By: <u> Evan Dubil </u> P&ID No: <u> - </u> RFQ No: <u> - </u>	Proj: <u> 3016769 </u> Doc: <u> Spec No. 235216A </u> Qty: <u> 2 </u>
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51	Factory-fabricated, -assembled, and -tested, fire-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls. Water heating service only.
52	
53	
54	
55	
56	
57	
58	

CONSTRUCTION DESIGN

59			
60			
61	Heat Exchanger:		
62	Stainless steel, corrosion-resistant combustion chamber. The heat exchanger shall be designed to prevent fluid boiling.		
63			
64			
65	All surfaces exposed to condensed flue gas shall be constructed of stainless steel.		
66			
67			
68	Boiler Casing:		
69	Maximum Surface Temperature:	_____	deg F
70	(Based on 100 deg F Ambient, 120 ft/min wind velocity)		
71			
72	Burner Throat (Seller to describe design in detail) *		
73	_____		
74	_____		
75	_____		
76			

PIPING CONNECTIONS

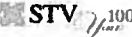
Connections	Quantity		Size		Type
Stack Inlet:	One (1)	_____	*	inches	*
Stack Discharge:	One (1)	_____	*	inches	*
Temperature Indicator:	One (1)	_____	*	inches	*
HW Inlet:	One (1)	_____	*	inches	*
HW Outlet:	One (1)	_____	*	inches	*

PIPING

87	Piping Notes	
88		
89		
90	<input checked="" type="checkbox"/> Seller shall provide a drawing of the boiler with his quotation indicating the location, sizes and ratings of all required connections.	
91		
92		
93	<input checked="" type="checkbox"/> All connections shall extend a sufficient distance past the casing so as not to interfere with insulation and provide sufficient clearance for mating flange and bolts.	
94		
95		

BUYER'S OTHER BOILER CONNECTIONS

Description	Size *	Rating / Type	Notes
Hot Water Supply / Return	4"	M-NPT Coupling	
Natural Gas Inlet: (Pilot if applicable)		M-NPT Coupling	
Natural Gas Inlet: (Main)	2"	M-NPT Coupling	

 STV Inc. New York, NY EQUIPMENT DATA SHEET		Fire Tube Condensing Boiler System		Tag: <u> B-1&2 </u> Rev: <u> A </u> Date: <u> 14-Aug-2014 </u>
Client: <u> NJ DPMC </u> Proj Name: <u> CRRNJ Terminal Building </u> Location: <u> Liberty State Park </u>		By: <u> Evan Dubil </u> P&ID No: <u> - </u> RFQ No: <u> - </u>		Proj: <u> 3016769 </u> Doc: <u> Spec No. 235216A </u> Qty: <u> 2 </u>
101	Stack:		Flanged	
102	Handholes:		N/A	
103	Manways:		N/A	
104				
105	CONTROL HARDWARE			
106				
107	* PLC Manufacturer:	<u> AERCO </u>	* VFD Manufacturer:	<u> * </u>
108	* PLC Model:	<u> ACS </u>	* VFD Model:	<u> * </u>
109	* Gateway Manufacturer:	<u> AERCO </u>	* Data Output Connections:	<u> RS485 & Ethernet </u>
110	* Gateway Model:	<u> ProtoNode </u>	* Compatibility:	<u> Metasys N2 & BACnet </u>
111				
112	CONTROL SYSTEM			
113				
114	Seller shall supply all controls, instrumentation, and safety devices required for the safe, efficient, and automatic operation of the units.			
115				
116				
117	All instruments, controls, and safety devices, shall be mounted on a common control cabinet mounted on front of the boiler, containing all necessary pushbuttons and lights for boiler operation.			
118				
119				
120	PERFORMANCE GUARANTEE			
121				
122	Seller shall guarantee that the performance of the boiler meets the specified process requirements at the design & operating conditions given in this material requisition.			
123				
124				
125	Seller shall guarantee the continuous rating of the boiler, efficiency at continuous rating with 15% excess air			
126				
127	The efficiency at the rated conditions shall be guaranteed to be not less than 93% at AHRI rating conditions			
128				
129	INSPECTION			
130				
131	Inspection certificate of shop inspection by a licensed hot water boiler inspector and insurance company shall be furnished to STV by boiler Seller.			
132				
133				
134				
135				

SECTION 235700 - HEAT EXCHANGERS FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

- A. Section includes plate heat exchangers.

1.03 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
- B. Operation and Maintenance Data: For heat exchangers to include in emergency, operation, and maintenance manuals.
- C. Quantities in accordance with Division 1 requirements.

1.04 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of domestic-water heat exchangers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including heat exchanger, storage tank, and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Periods: From date of Substantial Completion.
 - a. Plate, Water Heat Exchangers:
 - 1) Plate-and-Frame Type: One year(s).
 - 3. As part of bid, provide additional cost to extend warranty to 5 years from date of substantial completion.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment with protective crating and covering.
- B. Store equipment to prevent damage and protect from weather, dirt, fumes, water, and construction debris until final delivery date to the construction site.

PART 2 - PRODUCTS

2.01 GASKETED-PLATE HEAT EXCHANGERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Basis of Design product or comparable product by one of the following:
 - 1. ITT Corporation; Bell & Gossett
 - 2. Alfa Laval Inc.
 - 3. Armstrong Pumps, Inc.
 - 4. Or Approved Equal
- B. Configuration: Freestanding assembly consisting of frame support, top and bottom carrying and guide bars, fixed and movable end plates, tie rods, individually removable plates, and one-piece gaskets.
- C. All connections should be located on the frame plate (fixed head), allowing the pressure plate (movable head) to slide back and have plates added, removed, or replaced from the plate pack without disturbing the connections or associated piping.
- D. The design should allow for the removal of any plate in the plate pack without requiring the removal of any other plates.
- E. The unit shall be provided with an aluminum splash shield covering the sides and top of the plate pack. The bottom should be left open for leak detection.
- F. The unit shall be designed, tested, and U stamped in accordance with ASME Section VIII Division 1 and registered with the National Board. A U-1 data report to be furnished upon request.
- G. Manufacturer must be certified and registered with ISO 9001:2008. A certificate of registration shall be supplied upon request.
- H. Unit must be factory pressure tested with ASME U stamp applied on nameplate prior to leaving the factory.
- I. Frame:
 - 1. Capacity to accommodate 20 percent additional plates.
 - 2. The frame and pressure plates shall be carbon steel SA 516 grade 70.
 - 3. The frame and pressure plates shall be of sufficient thickness to meet the ASME design pressure without the use of stiffeners or other type of reinforcement.

4. Carbon steel frame components, except hardware, shall be painted with gray macro epoxy paint to a minimum of 4 mils dry film thickness.
 5. Carbon steel frame and pressure plates shall be steel grit blasted to SSPC-SP6/NACE 3 (Commercial Blast Cleaning) with surface profile of 2 mils on either face. All surfaces and openings must have a recoatable epoxy primer applied within 8 hours of blast or before flash rusting occurs.
 6. Frame plates shall have integral lifting eyes in the upper corners. Bolted or welded on lifting lugs not allowed.
 7. Units with studded port connections shall have unlined or alloy lined studded ports to mate with a raised face or flat faced ANSI flange where 150# ANSI flanges are acceptable. Rubber liners are not allowed.
 8. For units with studded port type connections, the studs around the ports must be provided by the manufacturer.
 9. Units with connections greater than 3" require that the thermal plates be supported by the top carry bar. The bottom guide bar shall only assist in properly aligning the plates.
 10. For ease of movement during assembly and maintenance, the movable pressure plate shall be supported by a roller assembly over the carry bar for 4" ported models greater than 90" in height and for all 6" and larger ported models. For 4" ported models less than 90" in height, a glide clip made of ultra high molecular weight polyethylene shall be used on the movable pressure plate.
 11. Units must be designed to withstand full test pressure in one circuit with zero pressure in the opposite circuit.
 12. The nominal connection size shall match the nominal thermal plate port hole diameter.
- J. Top and Bottom Carrying and Guide Bars: Painted carbon steel, or stainless steel.
- K. End-Plate Material: Painted carbon steel.
- L. Hardware:
1. All bolting, including tightening bolts, shall be carbon steel SA193 grade B7 and galvanized via electroplating of zinc coating.
 2. All nuts shall be carbon steel SA194 grade 2H and galvanized via electroplating of zinc coating.
 3. Mounting feet shall be zinc plated carbon steel.
 4. Tightening bolt assemblies on units with 3" and greater connections shall include lock washers at the movable pressure plate such that the unit can be opened and closed with one wrench from the front of the unit. Tightening bolt assemblies shall also include bearing washers at the fixed frame plate to reduce friction. Bearing assemblies only on some of the bolts is not allowed.
 5. The nuts on the tightening bolt assemblies on units with 3" and greater connections shall be peened on, not welded, at the frame plate.
- M. Plates:
1. Plate Material: 0.016 inch thick before stamping; stainless steel.
 2. Plates shall be pressed in a one-step stamping process, except for plates 132" and greater in length, where multi step pressing is allowed.

3. Plates shall use an integral rolled edge hanging system to provide a rigid hanger device between the plate and carry bar and guide bar. Welded on hanging brackets or stiffeners are not acceptable.
4. The plate pack shall use a positive plate to plate alignment system to ensure proper plate to gasket seals throughout the plate pack. The positive alignment system shall either be a gasket lug which fits within a plate recess on the proceeding plate (tongue in groove) to align successive plates or an extended rolled edge hanger which nests successive plates through direct contact around the entire plate hanger. Plate designs which only offer alignment through contact with the carry and guide bar are unacceptable.
5. Plates shall have an enclosing groove for the entire gasket designed to contain the gasket while allowing for thermal expansion.
6. Plates shall be permanently marked to indicate plate material and thickness.
7. Thermal plates must be designed to withstand full test pressure in one circuit with zero pressure in the opposite circuit.

N. Gaskets:

1. Gasket Materials: Glue free Nitrile rubber.
2. All gaskets for single pass designs, except the gasket on the first plate, shall be identical.
3. The gaskets shall be a one-piece construction with a double gasket barrier at the port region. The area isolated by the double gasket shall be vented to the atmosphere, so that a gasket failure is detected by leakage to the exterior prior to any possible cross contamination.
4. Gaskets shall have tapered sides to assure positive seating of the compressed gasket and assist in aligning the thermal plates during compression.
5. When available, glue-free gaskets are preferred to glued-on gaskets. Glue-free gasket attachment methods which break during gasket removal or plate maintenance, thus destroying the gasket, are not allowed.
6. Manufacturer shall select gasket materials to insure compatibility with the fluids and operating temperatures.

O. Piping Connections: Factory fabricated of materials compatible with heat-exchanger shell. Attach tappings to shell before testing and labeling.

1. NPS 4: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

P. Quantities:

1. One heat exchanger with design capacity listed in datasheet located in specification section 235700A.

2.02 ACCESSORIES

- A. Shroud: Aluminum sheet to enclose plates.

2.03 SOURCE QUALITY CONTROL

- A. The manufacturer shall guarantee the accuracy of the heat exchanger thermal and hydraulic design. Should the heat exchanger not perform to the specified conditions, within industry standard testing methods, accuracy and tolerances for plate and frame heat exchangers, the manufacturer is responsible to replace or repair the exchanger to achieve the stated performance.
- B. Hydrostatically test heat exchangers to minimum of one and one-half times pressure rating before shipment.
- C. Heat exchangers will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

2.04 FIELD QUALITY CONTROL

- A. The manufacturer shall provide support to the installing contractor for performance of the following field testing. Allow for a minimum of 1 man-week of field support.

PART 3 - EXECUTION (FOR REFERENCE ONLY)

3.01 EXAMINATION

- A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.
- B. Examine roughing-in for heat-exchanger piping to verify actual locations of piping connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 GASKETED-PLATE HEAT-EXCHANGER INSTALLATION

- A. Install gasketed-plate heat exchanger on custom-designed wall supports anchored to structure as indicated on Drawings.
- B. Install metal shroud over installed gasketed-plate heat exchanger according to manufacturer's written instructions.

3.03 CONNECTIONS

- A. Comply with requirements for piping specified in other Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Maintain manufacturer's recommended clearances for tube removal, service, and maintenance.
- C. Install piping adjacent to heat exchangers to allow space for service and maintenance of heat exchangers. Arrange piping for easy removal of heat exchangers.
- D. Install shutoff valves at heat-exchanger inlet and outlet connections.
- E. Install relief valves on heat-exchanger heated-fluid connection and install pipe relief valves, full size of valve connection, to floor drain.
- F. Install hose end valve to drain shell.
- G. Install thermometer on heat-exchanger and inlet and outlet piping, and install thermometer on heating-fluid inlet and outlet piping. Comply with requirements for thermometers specified in Section 230519 "Meters and Gages for HVAC Piping."
- H. Install pressure gages on heat-exchanger and heating-fluid piping. Comply with requirements for pressure gages specified in Section 230519 "Meters and Gages for HVAC Piping."

3.04 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 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.
- B. Heat exchanger will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.05 CLEANING

- A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.06 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain heat exchangers.

END OF SECTION 235700

STV Inc. New York, NY EQUIPMENT DATA SHEET	<h2 style="margin: 0;">Plate & Frame HX</h2>	Tag: <u> HX-1 </u> Rev: <u> A </u> Date: <u> 13-Aug-2014 </u>
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Client: <u> NJ DPMC </u>	By: <u> Evan Dubil </u>	Proj: <u> 3016769 </u>
Proj Name: <u> CRRNJ Terminal Building </u>	P&ID No: <u> - </u>	Doc: <u> Spec No. 235700A </u>
Location: <u> Liberty State Park </u>	RFQ No: <u> - </u>	Qty: <u> 1 </u>

1	rev	Service: <u> Heat Glycol Hot Water Supply </u>	Room: <u> Chiller Room </u>
---	-----	--	---

PROCESS INFORMATION

		<i>Hot Side</i>				<i>Cold Side</i>
5				rev		
6						
7		* Fluid Name: <u> Water </u>				* Fluid Name: <u> 30% Propylene Glycol </u>
8		* Flow Rate: <u> 205 </u> gpm				* Flow Rate: <u> 103 </u> gpm
9		* Temperature In: <u> 200 </u> deg F				* Temperature In: <u> 120 </u> deg F
10		* Temperature Out: <u> 180 </u> deg F				* Temperature Out: <u> 161.3 </u> deg F
11		* Pressure Drop: <u> 9.78 </u> psi				* Pressure Drop: <u> 2.9 </u> psi
12		* Nozzle Pressure Drop: <u> 0.301 </u> psi				* Nozzle Pressure Drop: <u> 0.0783 </u> psi
13		* Nozzle Velocity: <u> 5.7628 </u> ft/s				* Nozzle Velocity: <u> 2.8856 </u> ft/s
14		* Plate Velocity: <u> 5.379 </u> ft/s				* Plate Velocity: <u> 2.7026 </u> ft/s
15		* Channels: <u> 6 </u>				* Channels: <u> 6 </u>
16		* Specific Heat: <u> 1.0015 </u>				* Specific Heat: <u> 0.9365 </u>
17		* HT Coefficient: <u> 5864.1 </u> btu/hr,ft2,F				* HT Coefficient: <u> 1827.84 </u> btu/hr,ft2,F
18		* Reynolds Number: <u> 30522.26 </u>				* Reynolds Number: <u> 5203.81 </u>

MECHANICAL INFORMATION

21				rev		
22		* System Manufacturer: <u> Bell & Gossett </u>				* Number of Plates: <u> 13 </u>
23		* Model: <u> P22413TK </u>				* Fouling Factor: <u> 0.0002 </u> hr,ft2,F/btu
24						
25		* Heat Load: <u> 1,989,937 </u> btu				* Plate Material: <u> 304 SS </u>
26		* U Value: <u> 1,351 </u> btu/hr,ft2,F				* Plate Thickness: <u> 0.4 </u> mm
27						
28		* Design Pressure: <u> 150 </u> psi				* Excess Surface: <u> 33.18% </u>
29		* Test Pressure: <u> 195 </u> psi				* Carry Bar Length: <u> 600.0 </u> mm
30		* Design Temp: <u> 284 </u> deg F				* Carry Bar Material: <u> Aluminum </u>
31		* Min Temp: <u> 32 </u> deg F				
32		* Gasket Type: <u> Nitrile HT </u>				
33		* Plate Mixture: <u> TK </u>				* Lead Time: <u> * </u> days
34		* Plate Quantity/Max: <u> 13/54 </u>				

Features & Accessories

- 38 Capacity to accommodate at least 20% additional Plates.
- 39 Insulation Blanket.
- 40 Aluminum shroud to enclose plates.
- 41
- 42
- 43
- 44
- 45
- 46
- 47
- 48
- 49

PIPING CONNECTIONS

STV Inc. New York, NY EQUIPMENT DATA SHEET	Plate & Frame HX	Tag: <u> HX-1 </u> Rev: <u> A </u> Date: <u> 13-Aug-2014 </u>	
Client: <u> NJ DPMC </u> Proj Name: <u> CRRNJ Terminal Building </u> Location: <u> Liberty State Park </u>	By: <u> Evan Dubil </u> P&ID No: <u> - </u> RFQ No: <u> - </u>	Proj: <u> 3016769 </u> Doc: <u> Spec No. 235700A </u> Qty: <u> 1 </u>	
51	Connection		
52	Quantity	Size	Type
53	Hot Side: <u> Two (2) </u>	<u> 4 </u> inches	<u> Studded 150# ANSI RF </u>
54	Cold Side: <u> Two (2) </u>	<u> 4 </u> inches	<u> Studded 150# ANSI RF </u>
55	<u> * </u>	<u> * </u> inches	<u> * </u>
56	<u> * </u>	<u> * </u> inches	<u> * </u>
57			
58	SITE DATA		
59		rev	
60	Site Location: <u> Jersey City, NJ </u>		Seismic Design: <u> - </u>
61	Site Elevation: <u> 0 </u> feet		Ambient Temp Range: <u> 13 to 104 </u> deg F
62			
63			
64	WEIGHTS AND DIMENSIONS		
65	Weights		Overall Dimensions (W x D x H)
66	* Equipment Weight Empty: <u> 922 </u> lbs		* HX: <u> 20.5 x 23.6 x 47 </u> inch
67	* Equipment Weight Full: <u> 942 </u> lbs		* Installation space reqd: <u> * x * x * </u> inch
68	* Heaviest Maintenance: <u> * </u> lbs		
69	* Floor Loading: <u> * </u> psi		
70			
71			
72	NOTES		
73	<input type="checkbox"/>		
74	<input type="checkbox"/>		
75	<input type="checkbox"/>		
76	<input type="checkbox"/>		

SECTION 236423 - MODULAR WATER CHILLERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Packaged, Modular air-cooled, electric-motor-driven, scroll water chillers.

1.03 DEFINITIONS

- A. COP: Coefficient of performance. The ratio of the rate of heat removal to the rate of energy input using consistent units for any given set of rating conditions.
- B. EER: Energy-efficiency ratio. The ratio of the cooling capacity given in terms of Btu/h to the total power input given in terms of watts at any given set of rating conditions.
- C. IPLV: Integrated part-load value. A single number part-load efficiency figure of merit calculated per the method defined by ARI 506/110 and referenced to ARI standard rating conditions.
- D. kW/Ton: The ratio of total power input of the chiller in kilowatts to the net refrigerating capacity in tons at any given set of rating conditions.
- E. NPLV: Nonstandard part-load value. A single number part-load efficiency figure of merit calculated per the method defined by ARI 506/110 and intended for operating conditions other than the ARI standard rating conditions.

1.04 SUBMITTALS

- A. Product Data: Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.
 - 1. Performance at ARI standard conditions and at conditions indicated.
 - 2. Performance at ARI standard unloading conditions.
 - 3. Minimum evaporator flow rate.
 - 4. Refrigerant capacity of water chiller.
 - 5. Oil capacity of water chiller.
 - 6. Fluid capacity of evaporator.
 - 7. Characteristics of safety relief valves.
 - 8. Minimum entering condenser-air temperature

9. Performance at varying capacity with constant design entering condenser-air temperature. Repeat performance at varying capacity for different entering condenser-air temperatures from design to minimum in 10 deg F increments.
 10. Wiring diagram; Detailed wired diagrams for power, and controls.
 11. Piping and Instrumentation diagram (P&ID).
 12. Vibration isolation base details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails and base weights.
- B. Operation and Maintenance Data: Include operation and maintenance manuals for each piece of equipment.
 - C. Quantities in accordance with Division 1 requirements.
- 1.05 INFORMATIONAL SUBMITTALS
- A. Certificates: For certification required in "Quality Assurance" Article.
 - B. Source quality-control test reports.
 - C. Warranty: Sample of special warranty.
- 1.06 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For each water chiller to include in emergency, operation, and maintenance manuals.
- 1.07 QUALITY ASSURANCE
- A. ARI Certification: Certify chiller according to ARI 590 certification program.
 - B. ASME Compliance: Fabricate and stamp water chiller heat exchangers to comply with ASME Boiler and Pressure Vessel Code.
 - C. Comply with NFPA 70.
 - D. Oil Compliance: comply with UL 465
- 1.08 DELIVERY, STORAGE, AND HANDLING
- A. Deliver equipment with protective crating and covering.
 - B. Store equipment to prevent damage and protect from weather, dirt, fumes, water, and construction debris until final delivery date to the construction site.

1.09 COORDINATION

- A. Coordinate sizes and locations of equipment supports with actual equipment provided.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water chillers that fails in materials or workmanship within specified period.
1. Compressor Warranty Period: Five years from date of Substantial Completion.
 2. All Parts/Labor Warranty Period: One year from date of Substantial Completion.
 3. Provide as add alternate: 5 year all parts/labor warranty from date of substantial completion.

PART 2 - PRODUCTS

2.01 PACKAGED MODULAR AIR-COOLED WATER CHILLERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Basis of Design product or comparable product by one of the following:
1. Airstack (Multistack)
 2. ArctiChill
 3. Tandem Chillers
 4. Approved Equal.
- B. Description: Factory-assembled and run-tested modular water chiller complete with base and frame, condenser casing, compressors, compressor motors and motor controllers, evaporator, condenser coils, condenser fans and motors, electrical power, controls, and accessories.
- C. Fabricate base, frame, and attachment to water chiller components strong enough to resist movement during a seismic event when water chiller base is anchored to field support structure.
- D. All modules shall be ETL listed in accordance with UL standard 465.7, CSA certified per standard C22.2 #19, and shall bear the ASME UM stamp on all heat exchangers.
- E. Quantities:
1. Modules with capacities and characteristics as listed in this document.
 - a. One (1) Pump Module
 - b. Four (4) Chiller Modules with 60 tons cooling capacity each.
- F. Cabinet:
1. Base: Galvanized-steel base extending the perimeter of water chiller. Secure frame, compressors, and evaporator to base to provide a single-piece unit.

2. Frame: Rigid galvanized-steel frame secured to base and designed to support cabinet, condenser, control panel, and other chiller components not directly supported from base.
3. Casing: Galvanized steel.
4. Finish: Powder-coat paint finish.
5. Sound-reduction package consisting of the following:
 - a. Acoustic enclosure around compressors.
 - b. Reduced-speed fans with acoustic treatment.
 - c. Designed to reduce sound level without affecting performance.

G. Compressors:

1. Description: Positive-displacement direct drive with hermetically sealed casing.
2. Each compressor provided with suction and discharge service valves, crankcase oil heater, and suction strainer.
3. Operating Speed: Nominal 3600 rpm for 60-Hz applications.
4. Capacity Control: On-off compressor cycling.
5. Oil Lubrication System: Automatic pump with strainer, sight glass, filling connection, filter with magnetic plug, and initial oil charge.
6. Vibration Isolation: Mount individual compressors on vibration isolators. Resiliently mounted to the module with rubber-in-shear isolation.
7. Suction gas cooled compressor motor shall have a utilization range of $\pm 10\%$ from nameplate voltage and shall be equipped with internal thermostats for direct protection against overheating and external overcurrent and single phasing protection.
8. Each system also shall include high discharge pressure and low suction pressure cutouts manual reset safety cutouts.
9. Each module shall be individually fused and able to be electrically isolated from the other module to allow service to each module while all other modules are operational.
10. Provide with High ambient operation.

H. Compressor Motors:

1. Hermetically sealed and cooled by refrigerant suction gas.
2. High-torque, two-pole induction type with inherent thermal-overload protection on each phase.

I. Compressor Motor Controllers:

1. Across the Line: NEMA ICS 2, Class A, full voltage, nonreversing.

J. Refrigeration:

1. Refrigerant: R-410a. Classified as Safety Group A1 according to ASHRAE 34.
2. Refrigerant Compatibility: Parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.
3. Refrigerant Circuit: Each circuit shall include a thermal-expansion valve, refrigerant charging connections, a hot-gas muffler, compressor suction and discharge shutoff valves, a liquid-line shutoff valve, a replaceable-core filter-dryer, a sight glass with moisture indicator, a liquid-line solenoid valve, and an insulated suction line.

4. Refrigerant Isolation: Factory install positive shutoff isolation valves in the compressor discharge line and the refrigerant liquid-line to allow the isolation and storage of the refrigerant charge in the chiller condenser.

K. Evaporator:

1. Brazed Plate:

- a. Direct-expansion, single-pass, brazed-plate design.
- b. Type 316 stainless-steel construction.
- c. Code Compliance: Tested and stamped according to ASME Boiler and Pressure Vessel Code.
- d. Fluid Nozzles: Terminate with mechanical-coupling end connections for connection to field piping.

L. Air-Cooled Condenser:

1. Plate-fin coil with integral subcooling on each circuit, rated at 450 psig.
 - a. Construct coils of copper tubes mechanically bonded to aluminum fins.
2. Fans: Direct-drive propeller type with statically and dynamically balanced fan blades, arranged for vertical air discharge.
3. Fans shall be multi-blade vane-axial type, made of plastic composite material for quiet operation.
4. Fan Motors: Totally enclosed nonventilating (TENV) or totally enclosed air over (TEAO) enclosure, with permanently lubricated bearings, and having built-in overcurrent- and thermal-overload protection.
5. Condenser fans on VFD. To be controlled by head pressure and suitable for outdoor use.
6. Fan Guards: Steel safety guards with corrosion-resistant coating.

M. Chilled Water Mains:

1. Each module shall include internal 6" schedule 40, steel supply and schedule 40 steel return mains for chilled water. External headers are not acceptable. Chilled water mains shall be fully insulated. Grooved end connections shall be provided for interconnection to adjoining modules with standard victaulic type couplings. The complete chiller (regardless of number of modules) shall be capable of chilled waterside working pressures up to 450 psig. Individual refrigeration system evaporators shall be supplied from the water mains via 1½" steel pipe and connected with victaulic type couplings. Evaporator, suction lines, and all internal chilled water piping shall be fully insulated with closed cell insulation.

N. Variable Speed Pumping Evaporator Control Operation:

1. Each Module shall be provided with an individual evaporator heat exchanger for each refrigerant circuit. Each chilled water circuit in each module shall have an electronic solenoid valve to prevent water flow to that circuit when its compressor is turned off by the master controller. The return side of the heat exchanger shall have a manual shut off valve.

2. The building chilled water system shall have differential pressure sensor across the machine to maintain the set differential pressure across the machine by ramping up or down the evaporator pump VFD as required. This will provide variable flow to the chiller from full load down to minimum expected part load.

O. Lifting Frame

1. The chiller shall be provided with a structural steel lifting frame on the chiller. This frame will allow for the chiller to be rigged into place in one or more piece as required. The chiller's module shall be assembled into one single component as possible to reduce installation cost.

P. Pump Module:

1. Provide a Pump Module of size and capacity indicated on the drawings and schedules. The Pump Module shall be interconnected through the common chiller header system and require no additional water connections. Pump Module will become an integral part of the chiller system. Pump Module shall incorporate dual in-line centrifugal pumps in a Primary/Standby pumping arrangement. Pump starters and controls shall be provided to enable manual selection of lead pump. In addition, in the event of a loss-of-flow failure of the chilled water system, the Pump Module controls shall disable the lead pump and automatically start the standby pump. Module shall be completely factory assembled and tested prior to shipment.
2. Capacities and Characteristics:
 - a. Horsepower: 40 hp
 - b. Pump Type: Dual-Arm
 - c. External Feet of Head: 80 ft
 - d. Total Primary Loop Pressure Drop: 16.25 ft
 - e. Total Flow Rate: 625.4 gpm
 - f. Module FLA: 52.0
 - g. Variable Flow Speed Control: VFD
 - h. Mini Glycol Feeder with Expansion Tank

Q. Electrical Power:

1. Factory-installed and -wired switches, motor controllers, transformers, VFDs and other electrical devices necessary shall provide a single-point field power connection to water chiller.
2. House in a unit-mounted, NEMA 250, Type 3R enclosure with hinged access door with lock and key or padlock and key.
3. Wiring shall be numbered and color-coded to match wiring diagram provided by manufacturer.
4. Install factory wiring outside of an enclosure in a raceway.
5. Provide branch power circuit to each motor and to controls with one of the following disconnecting means:

- a. NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 60947-4-1.
 - b. NEMA KS 1, heavy-duty, nonfusible switch.
 - c. NEMA AB 1, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
6. Provide each motor with overcurrent protection.
 7. Overload relay sized according to UL 1995, or an integral component of water chiller control microprocessor.
 8. Phase-Failure and Undervoltage: Solid-state sensing with adjustable settings.
 9. Control Relays: Auxiliary and adjustable time-delay relays.
 10. Indicate the following for water chiller electrical power supply:
 - a. Current, phase to phase, for all three phases.
 - b. Voltage, phase to phase and phase to neutral for all three phases.
 - c. Three-phase real power (kilowatts).
 - d. Three-phase reactive power (kilovolt amperes reactive).
 - e. Power factor.
 - f. Running log of total power versus time (kilowatt hours).
 - g. Fault log, with time and date of each.
 11. Provide single-point power connection with pre-engineered wiring for field installation and connection to a factory-mounted chiller junction box. The junction box shall include individual fusing for each module set and provide a single point of connection to building power.

R. Central Control System

1. Multiple Module Chillers:
 - a. Each chiller shall be equipped with a dedicated master controller specifically designed for this chiller, which shall perform the numerous functions discussed in this section. All chiller operations and features shall be accessed through a keyboard built into the face of the computer. All status and output information shall be reported through the face mounted LCD display.
 - b. Operator Interface: Keypad or pressure-sensitive touch screen. Multiple-character, backlit, liquid-crystal display or light-emitting diodes. Display the following:
 - 1) Date and time.
 - 2) Operating or alarm status.
 - 3) Operating hours.
 - 4) Outside-air temperature if required for chilled-water reset.
 - 5) Temperature and pressure of operating set points.
 - 6) Entering and leaving temperatures of chilled water.
 - 7) Refrigerant pressures in evaporator and condenser.

- 8) Saturation temperature in evaporator and condenser.
 - 9) No cooling load condition.
 - 10) Elapsed time meter (compressor run status).
 - 11) Pump status.
 - 12) Antirecycling timer status.
 - 13) Percent of maximum motor amperage.
 - 14) Current-limit set point.
 - 15) Number of compressor starts.
2. Control Functions:
- a. Manual or automatic startup and shutdown time schedule.
 - b. Entering and leaving chilled-water temperatures, control set points, and motor load limit.
 - c. Current limit and demand limit.
 - d. External water chiller emergency stop.
 - e. Antirecycling timer.
 - f. Automatic lead-lag switching
3. Each module shall have its own microprocessor based sensor panel. This panel shall communicate with the master controller via low voltage plug-in cable provided by the manufacturer. The module sensor panel shall monitor and control each refrigeration system in response to commands by the master controller. The master controller shall have a terminal strip to accept field wired low voltage system interlock such as flow switches, auxiliary contacts, remote start/stop, common alarm output, etc.
4. Safeguarding operation of refrigeration system the master controller shall continually monitor all of the following areas for each individual refrigeration system:
- a. Discharge pressure cutout
 - b. Suction pressure cutout
 - c. Solid-state compressor motor protection
 - d. Suction temperature
 - e. Evaporator leaving chilled water temperature
5. Manual-Reset Safety Controls: The following conditions shall shut down water chiller and require manual reset:
- a. Low evaporator pressure or high condenser pressure.
 - b. Low chilled-water temperature.
 - c. Refrigerant high pressure.
 - d. High or low oil pressure.
 - e. High oil temperature.
 - f. Loss of chilled-water flow.
 - g. Control device failure.
6. The Master Controller shall monitor and report the following system parameters:
- a. Chilled Water Entering and Leaving Temperature
 - b. Chilled Water Water Flow

7. A potentially unsafe (out of tolerance) condition from any of these controls or sensors shall cause a "fault" shutdown of that compressor with an automatic transfer of load requirements to another available compressor. When a fault occurs, the master controller automatically shall record the readings of all conditions at that time and shall store the data for recall by operating personnel. This information shall be capable of being recalled at any time through the keys and display on the face of the master controller. A running history of the complete fault occurrence conditions shall be automatically maintained (up to the last 20 occurrences) should it ever be required for trouble shooting.
8. Continuous individual monitoring of leaving chilled water temperature from each refrigeration system shall provide protection against freeze-up in the event of unusual, unexpected operating conditions. Internal compressor operating schedules shall be automatically sequenced every 24 hours to assure even distribution of runtime.
9. Capacity modulation and temperature control - The master controller shall continuously monitor entering and leaving chilled water temperatures to determine actual system load and shall select the quantity of compressor required to match the load. Response times and set points shall be adjustable over a wide range.
10. Monitoring and recording of chiller operation - In addition to the monitoring and safeguarding functions for each of the refrigeration systems, the master controller also shall continuously monitor the chiller entering and leaving condenser and chilled water temperatures making this information continually available to operator personnel through the built-in LCD display. The system shall provide for variable time between compressor sequencing and temperature sensing, so as to fine-tune the chiller to different existing building conditions.
11. The master controller shall also accumulate the actual operating load profile of the chiller in terms of operating hours at each 10% load increment.
12. Chiller shall have external inputs and outputs to be compatible with the building management system. Inputs/Outputs include:
 - a. Remote Start/Stop
 - b. Cooling Alarm
13. Chilled water reset or demand limit input shall accept a 4-20 ma or 0-10 vdc signal from building management system to vary the associated system variables.

S. Safeties, Controls & Operation

1. Chiller safety controls system shall be provided with the unit (Minimum) as follows:
 - a. Low evaporator refrigerant pressure
 - b. Loss of flow through the evaporator
 - c. High condenser refrigerant pressure
 - d. High compressor motor temperature
 - e. Low suction gas temperature
 - f. Low leaving evaporator water temperature

2. Failure of chiller to start or chiller shutdown due to any of the above safety cutouts shall be enunciated by display of the appropriate diagnostic description at the unit control panel. This annunciation will be in plain English. Alphanumeric codes shall be unacceptable.
3. The chiller shall be furnished with a Master Controller as an integral portion of the chiller control circuitry to provide the following functions:
 - a. Provide automatic chiller shutdown during periods when the load level decreases below the normal operating requirements of the chiller. Upon an increase in load, the chiller shall automatically restart.
 - b. Provisions for connection to automatically enable the chiller from a remote energy management system.
 - c. The control panel shall provide alphanumeric display showing all system parameters in the English language with numeric data in English units.
4. Normal Chiller Operation:
 - a. When chiller is enabled, the factory supplied Master Controller modulates the chiller capacity from minimum to maximum as required by building load.
 - b. The Chiller control system shall respond to Entering Water Temperature and will have an integral reset based on entering water temperature to provide for efficient operation at part-load conditions.
 - c. Primary pump speed to be modulated to maintain constant pressure drop across chiller.
5. Power Phase Monitor:
 - a. Provide a Power Phase Monitor on the incoming power supply to the chiller. This device shall prevent the chiller from operating during periods when the incoming power is unsuitable for proper operation.
 - b. The Power Phase Monitor shall provide protection against the following conditions:
 - 1) Low Voltage (Brown-Out)
 - 2) Phase Rotation
 - 3) Loss of Phase
 - 4) Phase Imbalance

T. Remote Management System

1. The Master Controller will be provided with a hardware and software for remote communication with the BMS System.
2. All the functions of the Master Controller shall be available via the Remote Management interface including:
 - a. Adjustment of all system setpoints
 - b. Review and resetting of all "non-current" faults
 - c. Interrogation and display of all sensor readings
 - d. Display of chiller load profile

3. The web Portal shall communicate to the BMS system through any of the following protocols.
 - a. ModBus
 - b. BacNet
 - c. Metasys N2

U. Insulation:

1. Material: Closed-cell, flexible elastomeric, thermal insulation complying with ASTM C 534, Type I, for tubular materials and Type II, for sheet materials.
2. Thickness: 3/4 inch.
3. Factory-applied insulation over cold surfaces of water chiller components.
 - a. Adhesive: As recommended by insulation manufacturer and applied to 100 percent of insulation contact surface. Seal seams and joints.
4. Apply protective coating to exposed surfaces of insulation.

V. Accessories:

1. Factory-furnished, chilled-water flow switches for field installation.
2. Individual compressor suction and discharge pressure gages with shutoff valves for each refrigeration circuit.

A. Quantities:

1. Four (4) Airstack ASP060 Chiller Modules design capacity listed in datasheet located in specification section 236423A.
2. One (1) Airstack Primary Pump Module design capacity listed in datasheet located in specification section 236423A.

2.02 SOURCE QUALITY CONTROL

- A. Perform functional test of water chillers before shipping.
- B. All units shall be completely factory assembled, wired, piped. All units shall be tested on the stand which will have available a chilled water, system with all required instrumentation as to control the environment to produce the required design conditions. The test stand shall be able to maintain steady state design conditions at 105° F ambient. The unit shall be tested and operate at design conditions for a minimum 2 hours. All units shall be run at design conditions to verify all pressures and leaving condition are within the requirements of the specification.
- C. Microprocessor controls shall be factory adjusted and preset to the design conditions during testing.
- D. Electrical wiring paint to paint, control sequence and operation, thermal performance shall be verified before final exterior paint and shipment.

- E. Factory performance test water chillers, before shipping, according to ARI 506/110, "Water Chilling Packages Using the Vapor Compression Cycle."
- F. For water chillers located outdoors, rate sound power level according to ARI 370 procedure.

2.03 FIELD QUALITY CONTROL

- A. The manufacturer shall provide support to the installing contractor for performance of the following field testing. Allow for a minimum of 2 man-weeks of field support.

PART 3 - EXECUTION (FOR REFERENCE ONLY)

3.01 EXAMINATION

- A. Before water chiller installation, examine roughing-in for equipment support, anchor-bolt sizes and locations, piping, and electrical connections to verify actual locations, sizes, and other conditions affecting water chiller performance, maintenance, and operations.
 - 1. Water chiller locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 WATER CHILLER INSTALLATION

- A. Install water chillers on support structure indicated.
- B. Equipment Mounting:
 - 1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- C. Maintain manufacturer's recommended clearances for service and maintenance.
- D. Charge water chiller with refrigerant if not factory charged and fill with oil if not factory installed.
- E. Install separate devices furnished by manufacturer and not factory installed.

3.03 CONNECTIONS

- A. Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to chiller to allow service and maintenance.

- C. Evaporator Fluid Connections: Connect to evaporator inlet with shutoff valve, strainer, thermometer, and plugged tee with pressure gage. Connect to evaporator outlet with shutoff valve, balancing valve, flow switch, thermometer, plugged tee with pressure gage, flow meter, and drain connection with valve. Make connections to water chiller with a flange.
- D. Refrigerant Pressure Relief Valve Connections: For water chillers installed indoors, extend vent piping to the outside without valves or restrictions. Comply with ASHRAE 15.
- E. Connect each drain connection with a union and drain pipe and extend pipe, full size of connection, to floor drain. Provide a shutoff valve at each connection if required.

3.04 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.
- C. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
 - 1. Verify that refrigerant charge is sufficient and water chiller has been leak tested.
 - 2. Verify that pumps are installed and functional.
 - 3. Verify that thermometers and gages are installed.
 - 4. Operate water chiller for run-in period.
 - 5. Check bearing lubrication and oil levels.
 - 6. Verify proper motor rotation.
 - 7. Verify static deflection of vibration isolators, including deflection during water chiller startup and shutdown.
 - 8. Verify and record performance of chilled-water flow and low-temperature interlocks.
 - 9. Verify and record performance of water chiller protection devices.
 - 10. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
- D. Prepare a written startup report that records results of tests and inspections.

3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water chillers.

END OF SECTION 236423

STV Inc. New York, NY EQUIPMENT DATA SHEET		Modular, Packaged Air Cooled Chiller		Tag: <u>CH-01</u> Rev: <u>A</u> Date: <u>13-Aug-2014</u>	
Client: <u>NJ DPMC</u>		By: <u>Evan Dubil</u>		Proj: <u>3016769</u>	
Proj Name: <u>CRRNJ Terminal Building</u>		P&ID No: <u>-</u>		Doc: <u>Spec No. 236423A</u>	
Location: <u>Liberty State Park</u>		RFQ No: <u>-</u>		Qty: <u>1</u>	
1	rev				
2		Service: <u>Produce Chilled Water for HVAC</u>		Room: <u>Service Yard</u>	
3					
4		BASIS OF DESIGN INFORMATION			
5		SCOPE OF SUPPLY			
6					
7		As a minimum the system shall include the following equipment:			
8					
9		Item Number	Quantity	Required	Description
10		A	4	<input checked="" type="checkbox"/>	Chiller Modules - 60 ton Nominal Capacity
11		B	1	<input checked="" type="checkbox"/>	Pump Module
12				<input type="checkbox"/>	
13				<input type="checkbox"/>	
14				<input type="checkbox"/>	
15		PROCESS INFORMATION			
16		Specified Net Capacity	<u>238.88</u>	tons	rev
17		Input Power	<u>*</u>	kW	
18					Turndown Required: <u>25% Min</u>
19					Full Load (kW/Ton) <u>1.1440</u>
20					NPLV 550/590 (kW/Ton) <u>0.7170</u>
21		Liquid Chiller			
22					Refrigerant Used *
23		* Fluid Name:	<u>30% Propylene Glycol</u>		
24		* Evaporator Flowrate:	<u>625.4</u>	gpm	
25		* Inlet Temperature:	<u>55</u>	deg F	<input checked="" type="checkbox"/> R-410A Halogenated Fluorocarbon
26		* Outlet Temperature:	<u>45</u>	deg F	<input type="checkbox"/> R-123 Halogenated Fluorocarbon
27		* Pressure Drop (Max)	<u>16.3</u>	Ft.WC	<input type="checkbox"/> R-134 Halogenated Fluorocarbon
28		* Pressure Drop (Min)	<u>1.13</u>	Ft.WC	<input type="checkbox"/>
29		* Min Flow For Bypass	<u>127.4</u>	gpm	
30		* Control Accuracy Req'd:	<u>*</u>	deg F	Refrigerant Charge <u>220</u> Lbs
31		* Control Accuracy Actual:	<u>*</u>	deg F	*Per Module
32		Circulation Pumping Rate:		gpm	
33		Operating Range:	<u>13-104</u>	deg F	
34					
35		MECHANICAL INFORMATION			
36		* System Manufacturer:	<u>Airstack</u>		rev
37		* Chiller Model:	<u>ASP060XC14H2AL1AAASN-410A</u>		
38		* Pump Package Model	<u>PMP4025DHBMV</u>		* Header Size <u>8</u> inch
39					* Number of Passes <u>1</u>
40					* Header Connection <u>Grooved Coupling</u>
41					* Lead Time: <u>*</u> days
42		Compressor			
43		* Manufacturer:	<u>*</u>		rev
44		* Model:	<u>*</u>		
45		* Type:	<u>Scroll</u>		* Brake Power: <u>*</u> bhp
46		* Hermetically Sealed:	<u>Yes</u>		* Motor Power: <u>*</u> hp
47		* Compressor Speed:	<u>*</u>	rpm	* Quantity <u>2</u>
48		* Motor Speed:	<u>*</u>	rpm	* Nominal Capacity Each <u>30</u> Tons
					* Design Pressure: <u>*</u> psig
					* Control Type: <u>*</u>

STV Inc. New York, NY EQUIPMENT DATA SHEET	Modular, Packaged Air Cooled Chiller	Tag: <u>CH-01</u> Rev: <u>A</u> Date: <u>13-Aug-2014</u>
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Client: <u>NJ DPMC</u>	By: <u>Evan Dubil</u>	Proj: <u>3016769</u>
Proj Name: <u>CRRNJ Terminal Building</u>	P&ID No: <u>-</u>	Doc: <u>Spec No. 236423A</u>
Location: <u>Liberty State Park</u>	RFQ No: <u>-</u>	Qty: <u>1</u>

Evaporator & Condenser	
<p style="text-align: center;">Evaporator</p> * Construction Material: <u>316 SS</u> * Corrosion Allowance: <u>None</u> inch * Number of Circuits: <u>1</u> * Design Temperature: <u>*</u> deg F * Fouling Factor: <u>0.001</u> * Code Requirements: <u>ASME Section VIII</u>	<p style="text-align: center;">Condenser</p> * Tube Material: <u>Copper</u> * Fin Material: <u>Aluminum</u> * Tube Diameter: <u>3/8</u> inch * Rows: <u>6</u> * Design Temperature: <u>104</u> deg F <p style="text-align: center;">Fans</p> * Motor Type: <u>TEFC</u> * HP Each: <u>2</u> hp * Quantity: <u>4</u> fans * Fan Material: <u>Composite</u> * Airflow: <u>44,000</u> cfm * Fan Control: <u>VFD</u>

Primary Pump	
<p style="text-align: center;">General Information</p> Design Flow: <u>625.4</u> gpm Total Dynamic Head (TDH): _____ feet	rev _____

MECHANICAL INFORMATION	
<p style="text-align: center;">General</p> * Manufacturer: <u>Armstrong</u> * Model: <u>*</u> * Type: <u>Centrifugal</u> * Disch x Suction x Max Imp: <u>* x * x *</u> inch Pump Speed: _____ rpm Pump / Motor Mounting: <u>Coupled</u> Bedplate Type: <u>Fabricated Steel</u> * Rotation Facing Motor End: <u>*</u> <p style="text-align: center;">Impeller or Rotor</p> Diameter Furnished: _____ inches Diameter Maximum: _____ inches <p style="text-align: center;">Seal Flush</p> Seal Flush Fluid: _____ Seal Flush Required: _____ gpm _____ psig API Seal Flush Plan: _____	<p style="text-align: center;">Shaft Seal</p> Shaft Seal Type: _____ Mechanical Seal Type: _____ Shaft Seal Location: _____ Seal Manufacturer: _____ Seal Model: _____ Balanced Seal: _____ <p style="text-align: center;">Connections</p> Suction Size / Type: <u>* 150# ANSI FF Fig</u> Discharge Size / Type: <u>* 150# ANSI FF Fig</u> Suction Gauge Size/Type: <u>* Not Applicable</u> Disch Gauge Size / Type: <u>* Not Applicable</u> Casing Drain Size / Type: <u>*</u> <p style="text-align: center;">Coupling</p> * Coupling Manufacturer: <u>*</u> * Coupling Model Number: <u>*</u> * Coupling Type: <u>Flexible</u> * Coupling Guard Type: <u>Spacer w/ OSHA Guard</u>

PUMP MATERIALS OF CONSTRUCTION	
<p style="text-align: center;">Materials</p> Casing: _____ Impeller or Rotor: _____ Shaft: _____ Shaft Sleeve: _____	<p style="text-align: center;">Seal Materials</p> Rotating Face Inboard: <u>Tungsten Carbide</u> Stationary Face Inboard: <u>Carbon</u> Rotating Face Outboard: _____ Stationary Face Outboard: _____

STV Inc. New York, NY EQUIPMENT DATA SHEET	Modular, Packaged Air Cooled Chiller	Tag: <u>CH-01</u> Rev: <u>A</u> Date: <u>13-Aug-2014</u>
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Client: <u>NJ DPMC</u>	By: <u>Evan Dubil</u>	Proj: <u>3016769</u>
Proj Name: <u>CRRNJ Terminal Building</u>	P&ID No: <u>-</u>	Doc: <u>Spec No. 236423A</u>
Location: <u>Liberty State Park</u>	RFQ No: <u>-</u>	Qty: <u>1</u>

100	Gland:		Seal Housing:	<u>316 SS</u>
101	Coupling Guard:		Seal Elastomers:	<u>Viton</u>
102	Baseplate / Supports:		Seal Chamber Size:	<u>Oversized</u>
103				
104				

INCLUDED ACCESSORIES

106		<input type="checkbox"/> Needle valve for seal flush line	
107		<input type="checkbox"/> Seal flush piping material <u>304 SS</u>	
108		<input type="checkbox"/>	
109		<input type="checkbox"/>	
110		<input type="checkbox"/>	
111			

Evaporator Accessories

112			
113		<input checked="" type="checkbox"/> Core filter dryer to prevent carryover of liquid refrigerant into compressor suction	
114		<input checked="" type="checkbox"/> Liquid solenoid valves and strainers (tube side)	
115		<input checked="" type="checkbox"/> Moisture indicating sight glass.	
116		<input checked="" type="checkbox"/> Purge and drain valves on shellside, connections on tubeside.	
117		<input checked="" type="checkbox"/> Refrigerant Relief Valve Set	
118		<input checked="" type="checkbox"/> Suction and discharge shut-off valves	
119		<input checked="" type="checkbox"/> Chilled Water Supply Filter Cartridge	
120		<input checked="" type="checkbox"/> Factory furnished chilled water flow switches for field installation	
121		<input checked="" type="checkbox"/> Individual compressor suction and discharge pressure gages with shutoff valves for each refrigeration circuit.	
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123			

Chiller Features & Accessories

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125		<input checked="" type="checkbox"/> Lead Compressor Sequencing	
126		<input checked="" type="checkbox"/> Automatic Internal Rescheduling upon Fault	
127		<input checked="" type="checkbox"/> Automatic Logging of Any Fault Condition	
128		<input checked="" type="checkbox"/> Electronic Chilled Water Control	
129		<input checked="" type="checkbox"/> Quick Interconnect Modular Design	
130		<input checked="" type="checkbox"/> Designed for Quiet Operation	
131		<input checked="" type="checkbox"/> Pressure Controlled Fan Motors	
132		<input checked="" type="checkbox"/> Stainless Steel Evaporator	
133		<input checked="" type="checkbox"/> Stainless Steel Inlet Header	
134		<input checked="" type="checkbox"/> Multiple Independent Refrigeration Systems	
135		<input checked="" type="checkbox"/> Variable Flow Evaporator	
136		<input checked="" type="checkbox"/> Al/Cu Condenser Coils	
137		<input checked="" type="checkbox"/> Mini Glycol Feeder & Expansion Tank in Primary Pump Package	
138		<input checked="" type="checkbox"/> Single Point Power Connection	
139		<input checked="" type="checkbox"/> Low Ambient to -20F Including Fan VFDs	
140		<input checked="" type="checkbox"/> Primary Pump VFD	
141		<input checked="" type="checkbox"/> External Master Control Box	
142		<input checked="" type="checkbox"/> Electrical Connection Type - Junction Box	
143		<input checked="" type="checkbox"/> Carbon Steel Painted Lifting Frame	
144			

INSULATION

Components Insulated *	Material	Thickness Inches	Furnished By	Area sqft
Evaporator	See Specs	(inch)	Seller	*

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Proj Name: <u>CRRNJ Terminal Building</u>	P&ID No: <u>-</u>	Doc: <u>Spec No. 236423A</u>
Location: <u>Liberty State Park</u>	RFQ No: <u>-</u>	Qty: <u>1</u>

150	Evaporator head	See Specs	(inch)	Seller	*
151	Other	*	*		*
152		*	*		*

PAINTING

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Seller to prepare each chiller package with a prime coat and a finish coat. Seller to describe painting system for outdoor use as specified in the site section of the data sheets.

PIPING CONNECTIONS

Connection	Quantity	Size	Type
Drains:	Two (2)	* inches	M-NPT
Instrument Air:	N/A	* inches	F-NPT
Chilled Water Discharge:	One (1)	6 inches	150# ANSI RF
Chilled Water Inlet:	One (1)	6 inches	150# ANSI RF

ELECTRICAL

General Information	rev	Pump Motor Information
* NEC Area: <u>Non-Hazardous</u>		* Severe Duty: <u>Yes</u>
* Additional NEC Area: <u>N/A</u>		* Energy Efficient: <u>Yes</u>
* Power Supplied: <u>480 V /3 ph /60 Hz</u>		* Inverter Duty: <u>Yes</u>
* Power Draw (amps): <u>* amps</u>		* Motor Manufacturer: <u>*</u>
* Electrical Enclosures: <u>NEMA 12</u>		* Motor Model Number: <u>*</u>
* UL Labeled Control Panel: <u>Yes</u>		* Motor Speed: <u>* rpm</u>
* Wiring Standards: <u>NEC</u>		* Variable Speed Range: <u>* rpm</u>
* UL Listed Components: <u>Yes</u>		* Motor Enclosure: <u>TEFC</u>
* Transformer Required: <u>Yes</u>		* Motor Design Code: <u>NEMA</u>
* Emergency Stop Button: <u>Yes</u>		* Motor Starter Furnished: <u>Provide w/ VFD</u>

Electrical Motor Summary

Description	Voltage / Phase / Hertz	FLA	MCA	MCBA
Compressor	480 V /3 ph /60 Hz	*	*	*
Condenser Fans	480 V /3 ph /60 Hz	3.6	*	*
Primary Pump	480 V /3 ph /60 Hz	*	*	*

CONTROL HARDWARE

Control Hardware	rev	VFD Information
* Controller Type: <u>Microprocessor</u>		* VFD Manufacturer: <u>*</u>
* Controller Manufacturer: <u>*</u>		* VFD Model: <u>*</u>
* Controller Model: <u>*</u>		
* OIT Manufacturer: <u>*</u>		* Data Output Connections: <u>Refer to Spec</u>
* OIT Model: <u>*</u>		

Control Features

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- Master Controller provided with hardware and software for remote communication with BMS.
 - Individual microprocessor based control panel for each module.
 - Control panels plug-in low voltage connection to master controller.
 - Bacnet compatible.
 -

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200 <input checked="" type="checkbox"/> Automatic shutdown and restart based on load requirements. 201 <input type="checkbox"/> Adjustable operating temperature setpoint 202 <input type="checkbox"/> Alarm acknowledge button 203 <input type="checkbox"/> Alarm test button 204 <input type="checkbox"/> Circulating chilled fluid pump flowrate 205 <input type="checkbox"/> Circulating chilled fluid temperature 206 <input type="checkbox"/> Circulating status indicating lights 207 <input type="checkbox"/> High circulating temperature 208 <input type="checkbox"/> Low circulating temperature 209 <input type="checkbox"/> Low liquid level indicator to monitor fluid resevoir level 210 <input type="checkbox"/> On-off power switch 211 <input type="checkbox"/> Operating temperature indicator 212 <input type="checkbox"/> 213 <input type="checkbox"/> 214 <input type="checkbox"/> 215 <input type="checkbox"/> 216 <input type="checkbox"/> 217 <input type="checkbox"/> 218 <input type="checkbox"/>		
CONTROL PANEL		
219 220 221 Seller shall supply a diagnostic display panel with the following safety failures as a minimum: (Seller to indicate and / or confirm all functions) 222 223 224 <input checked="" type="checkbox"/> Low evaporator refrigerant pressure 225 <input checked="" type="checkbox"/> Loss of flow through evaporator 226 <input checked="" type="checkbox"/> High condenser refrigerant pressure 227 <input checked="" type="checkbox"/> High compressor motor temperature 228 <input checked="" type="checkbox"/> Low suction gas temperature 229 <input checked="" type="checkbox"/> Low leaving evaporator water temperature 230 Alarms: 231 232 <input checked="" type="checkbox"/> High circulating temperature 233 <input checked="" type="checkbox"/> Low circulating pump flowrate 234 <input checked="" type="checkbox"/> Low circulating temperature 235		
Warranty		
236 237 238 <input checked="" type="checkbox"/> One year parts warranty on the entire unit. 239 <input checked="" type="checkbox"/> An extended 4 years of parts coverage on the compressor. 240 4 year parts warranty extension on: 241 <input checked="" type="checkbox"/> Compressors 242 <input checked="" type="checkbox"/> Motor Starters 243 <input checked="" type="checkbox"/> Fans & Motors 244 <input checked="" type="checkbox"/> Water Condensers 245 <input checked="" type="checkbox"/> Solenoid valves & Heat Exchangers 246 247 248 249		

STV Inc. New York, NY EQUIPMENT DATA SHEET	Modular, Packaged Air Cooled Chiller	Tag: <u>CH-01</u> Rev: <u>A</u> Date: <u>13-Aug-2014</u>
Client: <u>NJ DPMC</u> Proj Name: <u>CRRNJ Terminal Building</u> Location: <u>Liberty State Park</u>	By: <u>Evan Dubil</u> P&ID No: <u>-</u> RFQ No: <u>-</u>	Proj: <u>3016769</u> Doc: <u>Spec No. 236423A</u> Qty: <u>1</u>
SITE DATA		
250 251 252 253 254 255	Site Location: <u>Jersey City, NJ</u> Site Elevation: <u>0</u> feet	rev Seismic Design: <u>-</u> Ambient Temp Range: <u>13 to 104</u> deg F
WEIGHTS AND DIMENSIONS		
257 258 259 260 261 262 263	Weights * Equipment Weight Empty: <u>*</u> lbs * Equipment Weight Full: <u>*</u> lbs * Heaviest Maintenance: <u>*</u> lbs * Floor Loading: <u>*</u> psi	Overall Dimensions (W x D x H) * Chiller: <u>* x * x *</u> inch * Control Panel: <u>* x * x *</u> inch * Installation space reqd: <u>* x * x *</u> inch * Tube Pull space reqd: <u>* x * x *</u> inch
NOTES		
265 266 267 268 269 270 271 272	<input checked="" type="checkbox"/> Fouling factor shall be based on American Refrigeration Institute, ARI-590 <input checked="" type="checkbox"/> Seller shall furnish a list of all items to be field installed. <input type="checkbox"/> Seller shall furnish complete Piping and Instrument Diagram with Proposal. <input checked="" type="checkbox"/> Seller shall provide a total of 24 hours services of a factory trained field representative to supervise the final leak testing, charging and initial start-up, including concurrent operator instructions. <input checked="" type="checkbox"/> Seller shall provide equipment arrangement drawing with Proposal. <input type="checkbox"/> Seller to furnish vibration isolation as required <input checked="" type="checkbox"/> Comply with ASHRAE 90.1-2010	

SECTION 260503 - ELECTRICAL PREPURCHASE GENERAL

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish equipment of size and rating as described in these Prepurchase Sections. The system shall include, but not be limited to, equipment with accessories, control equipment, and all required point-to-point interconnecting diagrams. It is the intent of this Prepurchase Specification to obtain equipment of proven standard available design. Deviation(s) from the requirements specified must be clearly identified by the manufacturer within the manufacturer's proposal, in order to enable evaluation of their effect in meeting the Owner's needs.
- B. The Owner or his agent reserves the right to assign this Contract to a Contractor, to be selected by the Owner. The installation of this equipment shall be performed by a Contractor, selected by the Owner. The equipment manufacturer(s) agrees that in the event of such assignment, he shall work under the Contractor in the same manner as he would had the Contract been originally awarded to the manufacturer by the Owner. Furthermore, the manufacturer shall be bound to and assume toward the Contractor all the obligations and responsibilities that he, by the Contract, assumes toward the Owner.
- C. Throughout these Specifications, the term "this Contractor" shall be understood to mean the individual, partnership or corporation to whom has been awarded the Contract for installing the work as specified in the Prepurchase Sections. The "manufacturer" shall be understood to be the manufacturer of the equipment specified in the Prepurchase Sections.
- D. The term "Prepurchase Sections," "Prepurchase Specification," or "Prepurchase" shall be defined to be all specification Sections attached and referenced within this document.

1.02 REFERENCES

- A. Equipment and materials shall be new of heavy-duty industrial construction, listed to the requirements of the applicable Underwriters Laboratories Standards by a nationally recognized testing agency, and manufactured in accordance with UL, NEMA, ANSI, and IEEE Standards.
- B. The following publications of the issue currently in effect during Bid shall form a part of these Specifications:
 - 1. National Electrical Code.
 - 2. National Electrical Manufacturers Associates (NEMA).
 - 3. American National Standards Institute (ANSI).
 - 4. Life Safety Code (NFPA 101).

1.03 QUALITY ASSURANCE

- A. The system bidder shall be the authorized dealer of the equipment manufacturer's organization, established to design and build the equipment, and shall be fully qualified

and authorized to provide service and parts for the equipment specified. The system supplier shall assume responsibility for the equipment and must demonstrate that experienced factory personnel are available on a 24 hour basis, seven days a week, for service from a location within 4 hours from the installation.

- B. All equipment specified in the Prepurchase Sections shall be provided from a single source. Make every effort to furnish all equipment of any generic equipment type from one manufacturer. All components requiring interface between portions of the system and between the system and the electrical distribution must be coordinated between manufacturers prior to submission of shop drawings for approval to ensure compatibility of equipment upon installation. Shop drawings shall be so annotated when submitted.
- C. Prior to Final Review, certify in writing that products and materials installed, and processes used, do not contain asbestos or polychlorinated biphenyls (PCB's), in a format acceptable to the Owner. In the event no product or material is available that does not contain asbestos, PCB's or hazardous materials as determined by the Owner, a "Materials Safety Data Sheet" (MSDS) shall be submitted for that proposed product or material prior to installation.
- D. In the event that materials, products, and/or processes being proposed for this Project contain, or may emit, any volatile organic compounds (VOC's), formaldehyde formulations, or hazardous out-gassing, as determined by the manufacturer, a "Materials Safety Data Sheet", as described above, shall be submitted as part of the shop drawing process for review by the Engineer and/or Owner.
- E. All equipment and material to be furnished and installed on this Project shall be approved for use in New Jersey or any other recognized agency, in accordance with the requirements of New Jersey, or any other Authority having jurisdiction, and be suitable for its intended use on this Project. Where there is no alternative to supplying equipment which is not listed, obtain special approval from the Authority Having Jurisdiction.
- F. All adhesives and sealants must not exceed the maximum volatile organic compound (VOC) limit (g/L) per industry standard for equipment intended to be used indoors - VOC Limits for Adhesives and Sealants.
- G. Affirm that all equipment proposed has been used in successful operation for a period of not less than five (5) years. As part of the bid provide a list of comparable installations, including the relationship of the supplied equipment models to the equipment proposed for this project. Define modifications made to the equipment, including reasons for modification.
- H. All work shall be in full accordance with the requirements of all local and governmental departments having jurisdiction over these matters. Secure and pay for necessary approvals, permits, inspections, carting, legal dumping, etc., and deliver the official records of the granting of permits to the installing Contractor without additional cost to the Owner.
- I. Pay royalties or fees required in connection with the use of patented devices, or systems, and save the Owner and the Consulting Engineers harmless from any claims or lawsuits

arising from such use and indemnify each thereof against attorneys' fees in connection therewith.

- J. All workmanship on components, parts, subassemblies, assemblies, and interconnections shall be provided to the best commercial practice, of current manufacture, and free of defects. All active electronic components shall be accessible from the front without the removal of subassemblies. Control logic, fuses, and wiring shall be isolated from power train components by metal barriers and shall be accessible from the front without exposure to any power component or high voltage hazard.
- K. Assume total system responsibility for all components and associated controls and be responsible for coordination of all system components.

1.04 WORK INCLUDED

- A. Provide all materials and services for manufacturing, and delivering to the designated address, the equipment described in the Prepurchase Sections. The work required by this Contract shall include the following:
 - B. This Contract shall include the following:
 - 1. Furnishing the equipment and system as described in these Prepurchase Sections.
 - 2. Complete shop drawings and installation drawings.
 - 3. Technical support and supervision as described hereinafter.
 - 4. Commissioning assistance for integration of this system with other existing systems and infrastructure, including any required testing of new and existing equipment specified in other Sections.
 - C. Provide instruction to the Owner's operating personnel in the proper operation and maintenance of this equipment.

1.05 MANUFACTURER'S PROPOSAL

- A. The information submitted with the bid shall include, but not be limited to, the following items:
 - 1. Technical proposal, including specification and description of all components, equipment and operation, including manufacturers of all major components and equipment.
 - 2. Completed technical data bid analysis and rating forms (See Appendices for all Sections).
 - 3. Set of drawings indicating system's configuration and dimensioned physical layout within allocated space. This shall include bus arrangement and dimensional drawings for all input, output, control, and distribution equipment.
 - 4. Lead times including:

5. Lead time to issue shop drawings from time of order.
 6. Lead time of equipment following approval of shop drawings.
 7. Qualifications.
 8. Shipping method and crating description.
 9. Physical dimensions and weight of all items to be shipped. Verify that all items can be delivered to the point of service and indicate what reassembly, if any, shall be required.
 10. Bidders shall state the range of optimum environmental conditions under which the equipment shall achieve maximum reliability of service and greatest life expectancy.
 11. Provide heat of rejection for all equipment at full load conditions.
 12. Warranty statements.
- B. None of the technical data required with the proposal shall be construed as "shop drawings", nor will they fulfill the contractual obligation for submission of "shop drawings" as stated in the Contract Documents.
- C. Compliance Review
1. Bidders shall provide a Compliance Review of all drawings, Specifications and addenda.
 - a. The first section of the Compliance Review will be a review of the drawings.
 - b. The second section will be a paragraph-by-paragraph review of the Specifications with the following information, "C", "D", or "E", marked in the margin of the original Specification and any subsequent addenda.
 - 1) "C": Comply with no exceptions.
 - 2) "D": Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the specification can be satisfied.
 - 3) "E": Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives.
 - 4) Unless a deviation or exception is specifically noted in the Compliance Review, it is assumed that the Bidder is in complete compliance with the plans and Specifications. Deviations or exceptions taken in cover letters, subsidiary documents, by omission, or by contradiction do not release the Bidder from

being in complete compliance, unless the exception or deviation has been specifically noted (explicitly, not by implication) in the Compliance Review.

- D. Provide the following information on service and maintenance:
1. Locations of factory authorized service capability, number of full-time factory-trained personnel at each location, specific experience on equipment specified in these Prepurchase Sections, including skill levels.
 2. Location and response time of local service organization providing primary service to the facility. The response time shall be considered the interval between the initial request and the time that the representative arrives on the site. The maximum acceptable response time is four (4) hours. Include listing of spare parts that are stocked at the local service location.
 3. Escalation procedures if problems fail to be resolved.
 4. Recommended preventive maintenance tasks and intervals.
 5. Price list of a complete list of spare parts, with notation of recommended spare parts that the Owner should maintain on site for the entire system to ensure minimum downtime for repair. If any of these parts has a limited shelf life, it shall be identified. Include price list for additional spare parts as noted in the Alternate Prices Section of this Specification.
- E. Compliance with all commitments made by this Bidder, including, but not limited to, submissions, scheduling, fabrication, delivery, testing, etc., including all component elements required by these Contract Documents, including those outsourced, is the sole responsibility of this Bidder.
- F. The bidders shall clearly point out in their proposal the need for environmental protection when stored in unconditioned areas of construction and temporary protection from damage caused by the normal construction practices, etc., so that the associated cost can be clearly determined. All work at the project site related to the installation of equipment, including unloading, rigging, and moving to the point of installation, shall be by the Contractor.

1.06 SUBMITTALS

- A. After receipt of Contract or specific direction from the Owner, prepare and submit for review, detailed shop drawings for the equipment furnished under these Prepurchase Sections. In case of question, the Owner's Representative shall be the final judge as to the requirement for shop drawings for specific areas of work.
- B. All submittals shall be complete and shall contain detailed information for all components of the system, and the necessary wiring diagrams and/or interconnecting cable schematics for all connection of the equipment furnished. The shop drawings shall include, but not be limited to, the following:

1. Interconnect diagrams furnished as composite drawings for all components indicating point-to-point wiring and terminations for all power, control and monitoring cables.
 2. Floor plan showing materials, sizes, anchoring, location and quantity of power and control wiring and conduit and cable entries.
 3. Performance characteristics, including time-current curves for all overcurrent protective equipment.
 4. Wiring and schematic diagrams of all power, control, metering and any other circuits.
 5. Schedule of lugs with manufacturer's part number, quantity and size.
 6. Handling, installation and assembly drawings.
 7. Sample of the maintenance manuals and documentation to be supplied.
 8. Manufacturer's literature of all major components.
- C. Where standard catalogue cut sheets or documentation covering a variation in size, type or performance of similar or related equipment are submitted as part of the package, the specific item proposed to be provided shall be highlighted to avoid misunderstanding as to the intent.
- D. All shop drawings shall be submitted in both printed and electronic format. The bidder shall assume three printed sets of shop drawings accompanied by three CD-ROM(s) with exact PDF copies of the printed submission.
- E. All submittals shall be a complete package including the following:
1. A cover sheet noting the date of the submittal, title of the submittal, name of the submitter, and revision number
 2. An index noting all major sections with referenced page numbers
 3. All pages shall be sequentially numbered.
- F. Submittals shall contain all required and detailed information for all components of the system, including all necessary wiring diagrams and/or interconnecting cable schematics for connection of associated switchboards, controls, and auxiliaries. The interconnect diagrams shall be composite drawings for all components and shall indicate wiring and termination points for all cable. Show all contiguous construction related to the mounting of equipment for the coordination of all Trades. The review of any submitted data or shop drawings for material, equipment apparatus, devices, arrangements and/or layout shall not relieve the manufacturers from the responsibility of furnishing same of proper dimensions and weight, capacities, sizes, quantity, quality and installation details to efficiently perform the requirements and intent of the Contract. The review shall not

relieve the manufacturer from responsibility for errors of any sort on the submitted data or shop drawings.

- G. Upon resubmission of shop drawings, a cover letter shall address all comments made by the Engineer and/or Architect (referenced by page, paragraph, etc.). Resubmissions shall be complete and include all of the previous submissions documentation and any additional information. New information shall be submitted as part of an appendix, and shall be cross-referenced on the appropriate page within the submittal. Highlight all changes to the prior submission.
- H. After final review of the shop drawings, the manufacturer shall furnish to the Owner a complete, corrected, set of the shop drawings, corrected to include all comments developed in the review. The final shop drawings shall be submitted in fully functional PDF including a hyperlinked index.

1.07 OPERATING AND MAINTENANCE INSTRUCTION AND MANUALS

- A. Eight (8) sets of operating and maintenance instructions and manuals, covering completely the operation and maintenance of the equipment furnished hereunder, shall be submitted to the Owner. Eight (8) sets of parts lists and manuals for each item of equipment shall be furnished to the Owner. Maintenance manuals shall outline all necessary periodic functions required and shall include a recommended system for keeping logs and records. Include troubleshooting charts, schematics of all assemblies and wiring diagrams, in sufficient detail and clarity to enable the Owner's technicians to understand, operate, and maintain the system. Each shall also be submitted in electronic format acceptable to the Owner (DVD, CD, etc.).

1.08 TRAINING

- A. Provide personal on-the-job instruction by factory-trained engineers for the specified number of building operators. This instruction shall be scheduled at time(s) convenient to the Owner's personnel. Instruction shall cover all equipment and systems provided under these Prepurchase Sections. The number of hours is a minimum requirement; where additional hours are specified in other paragraphs of this Section, those hours shall be additive to the minimum above.
- B. Instruction shall be comprised of both classroom type and actual hands-on operating experience. Submit an outline of the instruction program and instruction manual to the Owner for his approval at least two (2) months prior to the proposed start date of the instruction sessions.
- C. The Owner reserves the right to videotape all instruction sessions for purposes of future training. Provide a review and written critique of the Owner's videotape within one (1) month after completion of the instruction sessions and receipt of the Owner's videotapes. The critique shall correct all mistakes and clarify all outstanding questions, which arise during the sessions.

1.09 WARRANTY

- A. The standard manufacturer warranty shall be for full-value replacement for a minimum of two (2) years from the date the Owner approves/accepts the Contractor's Letter of Final Completion. The standard warranty shall include all necessary routine maintenance on all equipment included in this prepurchase package.
- B. The manufacturer shall warrant for a period of 20 years that it shall maintain a complete parts inventory and make the same available for replacement of any of the units provided. Unless specifically purchased by the owner, these parts may be available to other customers of the manufacturer as well. Manufacturer, in accepting orders, states that it shall be responsible for any direct costs incurred by Owner for failure to comply with this warranty.
- C. All equipment shall be new, of first-class material, and of a proven design. Workmanship shall be of the best quality, free from any defects that might render the equipment unsuitable or inefficient for the purpose for which it is to be used. The manufacturer shall guarantee that, during the construction phase, a qualified service representative will respond to the site within a maximum of four (4) hours of notification. The service person shall be capable of affecting all necessary repairs and restoring the system.
- D. The manufacturer shall guarantee his equipment to meet the performance for a period of two (2) years from completion of substantial performance. The Vendor shall provide a written Agreement which will include the desired warranty period and all preventive maintenance required during the warranty period of the equipment warranty in order to comply with these Prepurchase Sections.
- E. Although the guarantee shall be enforceable as provided, no requirement of this Contract with respect to guarantees by the manufacturer shall be deemed to be a limitation upon any rights which the Owner would have, either expressed or implied, in the absence of such guarantees, the said guarantee being given only for the greater assurance of the Owner.
- F. At Bid provide an additional cost to extend the warranty to 5 years.

1.010 DELIVERY, DRAYAGE AND HAULING

- A. Unless noted elsewhere, the delivery location for this equipment shall be the Central Railroad of New Jersey Terminal, Liberty State Park, Audrey Zapp Dr, Jersey City, NJ.
- B. Unless noted elsewhere, the job site location for the performance of the construction support activities specified herein shall be the Central Railroad of New Jersey Terminal, Liberty State Park, Audrey Zapp Dr, Jersey City, NJ.
- C. After the satisfactory completion of the acceptance test at the factory, the equipment shall be suitably packed to prevent any damage in transit. Any movable parts shall be suitably blocked. Crates, where used, shall be of sufficient strength to prevent damage due to stacking and shall be suitable for handling with a fork lift truck or equipped with lifting eyes. Packing shall be labeled as to contents, to facilitate the unpacking and assembly

sequence at the job site. Crates containing critical electronic components shall include bags of desiccant to absorb moisture. Heavy gauge transparent plastic covers shall be used to protect all equipment from water damage during shipping and/or storage.

- D. All finished painted surfaces and metal work shall be protected from the weather during shipment.
- E. Trucks used to ship the equipment shall be a maximum of 30 feet in length, fully enclosed, air cushion type, having shock recording instruments, with a direct routing to the job site. Deliveries must be coordinated with Owner and Contractor for receiving and unloading equipment from truck.
- F. Equipment shall be provided with shipping splits as required to insure that the largest single piece may be rigged into the intended space for the equipment. The maximum weight and size of any shipping crate shall be subject to approval by the Owner and Contractor.
- G. Contractor shall be advised 7 days prior to delivery of the equipment. Staging of delivery to site shall be subject to Contractor's approval.
- H. Spare parts shall be held at the factory until released by the Owner.
- I. The date of delivery of the system shall be included in the Bid. A progress chart shall be included in the Bid, indicating when the major components of the system would be purchased, design and interconnection wiring diagrams completed, the assembly performed, factory testing, crating and shipping finalized, and the equipment delivered for installation at the job site to demonstrate how the projected delivery date would be met. Show each deliverable item on the progress chart as an individual path, tracking its progress. Not less than two additional progress reports shall be submitted by the manufacturer during the production phase to support the established delivery schedule.
- J. As part of the Bid include a monthly cost for delaying equipment delivery from the proposed delivery date, as noted in the contract document, and storing the equipment for up to six (6) months.
- K. Bidders shall state the amount and type of liability (personal, property, automobile) insurance provided by the manufacturer for the system described in the Prepurchase Sections.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Refer to all other Divisions for additional equipment requirements.

PART 3 - EXECUTION

3.01 GENERAL

- A. Installation shall be in accordance with the Contract Documents for all Divisions pertaining to the individual equipment and/or systems.**

END OF SECTION

SECTION 260573 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY AND ARC-FLASH STUDY

PART 1 - GENERAL

1.01 SUMMARY

- A. Provide a preliminary overcurrent protection device coordination study for the pre-purchased service switchgear and emergency power system to assure a completely coordinated system from the service entrance to individual branch circuit devices.
- B. As part of the final complete power distribution system, provide a complete overcurrent protection device coordination study for the entire power distribution system, inclusive of the pre-purchased emergency power system and service switchgear as well as all other power system components, to assure a completely coordinated system from the service entrance to individual branch circuit devices.

1.02 RELATED SECTIONS

- A. The following specification sections apply to all Work herein:

- 1. Section 26 05 03 - Electrical Pre-Purchase General.
- 2. Section 26 24 13 - Service Switchboard.
- 3. Section 26 36 23 - Automatic Transfer Switches.

1.03 REFERENCES

- A. All overcurrent protective devices shall be designed, manufactured, and tested in accordance with the latest applicable codes and reference standards, including the following:
- B. Codes:
 - 1. NEC - National Electrical Code New Jersey Amendments.
- C. Reference Standards:
 - 1. IEEE Gold Book.
 - 2. NFPA 70E.

PART 2 - PRODUCTS

2.01 ACCEPTABLE VENDORS

- A. All substitutions must be identified in the Base Bid as a voluntary DEDUCT alternate, and must be accompanied by a letter of equivalency certifying the vendor's equivalency in all performance and physical characteristics to the vendors listed herein. The proposed substitutions shall be inclusive of all cost and physical implications throughout the project. Under no circumstances should the substitution result in added cost to the project. Should the substitution be approved neither the project specifications nor the contract documents will be revised to reflect the substitution.
- B. If it complies with the Contract Documents, a short circuit/arc-flash/overcurrent protection/coordination study by one of the following Vendors will be acceptable:

1. Baker Associates.
2. Barnett Associates.
3. Power Analysis Associates.
4. SDM Metro.
5. Skae Power Solutions.
6. Source One Power Technologies.
7. Triad.

8. Or approved equal.

2.02 GENERAL

- A. The short circuit/arc flash/overcurrent protection/coordination study shall be coordinated with the switchboard, panelboard, enclosed switch, breaker, variable frequency drive, and other vendors which require protection.
- B. Submit an integrated short circuit and coordination study for the entire power distribution system to assure a completely selective coordinated system from the main protective devices to individual branch circuit devices. Additionally, submit an arc flash study with required calculations in accordance with NFPA 70E.
- C. Include a short circuit study for the entire power distribution system to assure all devices provided under this Division and devices provided under other Divisions have sufficient withstand capability to allow safe flow of fault currents if the device is not required to interrupt the fault, and sufficient fault clearing ability to safely operate under a phase to ground, phase-to-neutral and three-phase bolted fault condition for fault clearing devices. This Contractor shall be responsible to modify or change the protective devices and meet the requirements of the short circuit study. Series rating of device in UL approved combinations shall be permitted where such series rating is noted in the report and approved by the Engineer.
- D. The equipment reviewed in this study shall include, but not be limited to, the following:
 1. Incoming Electrical Service.
 2. Generator Power System.
 3. Switchboards.
 4. Panelboards and Load Centers.
 5. Disconnect Switches and Circuit Breakers.
 6. Motor Controllers (Starters and Variable Frequency Drives).
 7. Automatic Transfer Switches.
 8. Dry-Type Transformers.

PART 3 - EXECUTION

3.01 SHORT CIRCUIT/OVERCURRENT PROTECTION/COORDINATION STUDY

- A. The study shall be submitted in three (3) stages:
 1. Draft Study No. 1 utilizing preliminary information from other sections and feeder lengths as indicated or implied on the engineering design drawings.
 - a. Provide the expected short circuit currents at each point in the distribution. Including notations where the calculated short circuit current exceeds the rating of

the protective device and provide suggested alternative devices to provide sufficient withstand or fault clearing capacity.

- b. Provide recommended settings for all devices furnished under this Division, comment on settings recommended by other Divisions, determine short circuit currents at all major nodes during various operating schemes, including electrical service from PSE&G, electrical service from the standby/emergency power plant, assume major motor loads are on line.
2. Draft Study No. 2 shall be an update of Draft Study No. 1, but shall utilize final, specific information from other Divisions, and shall incorporate the Consulting Engineer's comments on the first submission from all sections. This submission shall also include any additional equipment provided in the fitout, as well as any changes or modifications to the project design.
3. The Final Study shall be an update of Draft Study No. 2, but shall utilize actual feeder lengths as determined by this Division and final information from other trades, as well as any changes or modifications to the project design.
4. Field-adjust settings of all devices furnished under this Division and other Divisions previously described to recommended position as per the final coordination study. Inspect the settings of all devices furnished under other Divisions to determine if they have been set to the recommended position as per the final coordination study. Provide a label at each device with ALL recommended settings, the date set, and the name of the person that implemented the settings.
5. All devices furnished under this Division shall be individually field tested for proper calibration and operation by an independent testing company retained by this Contractor using a primary injection method for all circuit breakers. Submit field testing reports for record.

3.02 ARC FLASH STUDY

- A. Include an Arc-Flash Hazard study for the entire power distribution system to assure safe operating conditions for all equipment provided under this Contract and devices furnished by the Owner for installation under this Contract. This Contractor shall be responsible for providing and setting warning labels and shall set all protective devices to meet the study. The study shall, at a minimum, indicate:
 1. Minimum Arc Rating in cal/cm^2 at a working distance of 18 in. for all 480 volt devices.
 2. Indicate the appropriate Flash Hazard Boundaries.
 3. Indicate the appropriate PPE levels.
- B. All equipment shall be labeled in accordance with the determined arc-flash study, including the energy level present and required personnel protective equipment (PPE).
- C. Provide safety training to Owner's employees who have potential to work on live equipment.

END OF SECTION

SECTION 262413 - SERVICE SWITCHBOARD

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish and deliver all free-standing, dead-front type 600 volt service switchboard utilizing individually mounted circuit protective devices, including surge protection devices (SPD) as required for the distribution of lighting and power throughout the building as indicated on and in accordance with the requirements of the Contract Documents.
- B. Section includes:
 - 1. Service Switchboards.
 - 2. Ground Fault Protection System.

1.02 RELATED SECTIONS

- A. The following specification sections apply to all Work herein:
 - 1. Section 26 05 03 - Electrical Pre-Purchase General.
 - 2. Section 26 05 73 - Overcurrent Protective Device Coordination Study and Arc Flash Study.

1.03 REFERENCES

- A. Switchboards and all components shall be designed, manufactured, and tested in accordance with the latest applicable codes and reference standards, including the following as modified to conform to Bureau of Electric Control Advisory Board requirements:
- B. Codes:
 - 1. BCSNJ - Building Code of the State of New Jersey.
 - 2. NJSEC - New Jersey State Electrical Code.
- C. Reference Standards:
 - 1. ANSI 37.20, C37.51 - Switchgear Assemblies Including Metal-Enclosed Bus.
 - 2. CSA Listed C22.2.
 - 3. NEMA PB 2 - Deadfront Distribution Switchboards.
 - 4. NEMA SG-5. - Power Switchgear Assemblies.
 - 5. UL Standard 891 - Switchboards.
 - 6. UL Standard 977 - Fused Power - Circuit Devices.

1.04 SUBMITTALS

- A. The following submittal data shall be furnished according to the Conditions of the Construction Contract, Division 01 and shall include, but not be limited to:
 - 1. Switchboard, complete with physical dimensions and weights, elevations, plan views, schematic diagram, buswork details, nameplate data, voltage, current, and short circuit ratings, materials, bus capacity data, circuit schedule, connector details, factory test reports, installation details, etc.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the requirements of the Division 01.

1.06 WARRANTY

- A. Comply with the requirements of Section 26 05 03.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment which does not comply with the performance and/or physical characteristic requirements of the Contract Documents.
- B. If it complies with the Contract Documents, service switch assemblies and distribution switchboards manufactured by one of the following will be acceptable:
 - 1. Eaton/Cutler-Hammer.
 - 2. General Electric.
 - 3. Siemens Industry Inc.
 - 4. Square "D".
 - 5. Or approved equal.
- C. If it complies with the Contract Documents, overcurrent protective devices manufactured by one of the following will be acceptable:
 - 1. Eaton/Cutler-Hammer.
 - 2. General Electric.
 - 3. Siemens Industry Inc.
 - 4. Square "D".
 - 5. Or approved equal.

2.02 RATINGS

- A. Switchboards shall be fixed-mounted, outdoor switchboard construction, arranged for 480Y/277 volt, 3 phase, 4 conductor, full-neutral and 25% ground bus, or as indicated on the Drawings, and assembled complete with spares, spaces and circuit protective devices with capacities as indicated on the Drawings.
- B. Switchboard and their overcurrent protective devices shall be listed, and have a minimum short-circuit interrupting rating/withstand rating of 65,000 amperes RMS symmetrical at 480 volts.

2.03 CONSTRUCTION

A. General Construction

1. The outdoor enclosure shall meet the applicable requirements of the New Jersey State Electric Code and NEMA.
2. Each section shall be provided with adequate lifting means, and shall be capable of being rolled or moved into installation position and bolted to the structural support system. Individual shipping sections shall be designed for bolting together at the installation site. All necessary hardware required for bolting, including steel channels with shims for leveling, as well as main bus splices, shall be supplied with the switchboard sections.
3. Adequate conduit space shall be provided in the rear compartments if rear-accessible, or side gutters if not rear-accessible, to satisfy the current ratings of the individual devices and feeder sizes within a vertical section. All cable terminations shall be made with two-bolt hole concentric compression type lugs, which shall be supplied with the switchboard section and approved by the Engineer.

2.04 SERVICE SWITCHBOARDS

- A. Service switchboard assemblies shall be arranged in accordance with the details and schedules shown on the drawings and as hereinbefore described for distribution switchboards except where in conflict with the requirements described hereinbelow.
- B. Metal-enclosed main service switch assemblies shall consist of incoming service termination, overcurrent protective devices, fuses, etc., metering current transformer section and outgoing sections. Each service switch shall be enclosed in a self-supporting metal cubicle. Provide isolation barriers and approved nonhygroscopic fire stops at main buses entering and leaving the current transformer section and between each service switch and its respective outgoing section.
- C. Where main service switch sections are contiguous with associated distribution switchboard, provide fire barrier comprised of 3/4 inch nonhygroscopic fiber board between metal end closures of service switch and distribution switchboard assembly. All bus openings in barrier shall be closed with snug fitting, approved nonhygroscopic arc-resisting material. A 1 foot minimum separation shall be provided between service switch and distribution section.
- D. Main bus and section buses shall be provided in each switchboard section and shall be copper with either silver or tin plating at all joints. All main bus shall be either welded or bolted to section bus and bolted where main bus extends to adjacent shipping sections. Bolted joints shall consist of silver or tin plated splice plates and high tensile strength steel bolts with nuts and Belleville washers tightened to the proper torque requirements as dictated by the Belleville washers and UL requirements.
- E. Bus bars shall be adequately braced to withstand resulting mechanical forces exerted during short circuit conditions when subjected to short circuit currents but no less than 65,000 amperes rms symmetrical.
- F. All buses shall be assembled so as to maintain the minimum UL electrical clearances without the use of insulating material. Load studs shall be equipped with load extension buses, terminating in copper-bodied solderless concentric compression type 2 bolt-hole long-barrel lugs in the rear cable compartment of each structure. Bus extensions shall be silver or tin plated where outgoing lugs are attached. The rear cable or bus duct section shall be barriered from the

main bus section using nonhygroscopic material. Provide barriers in sections so that all bus connections can be made accessible for thermoscanning without removal of the entire barrier. Provide non-metallic cable supports to allow the cables to be "shaped" and supported.

- G. A continuous 1/4 inch x 4 inch copper ground bus, readily accessible upon removal of rear panels, shall be run through and connected to all component parts of the switchboard structure. Provide for connection of 500 kCMIL copper ground connection.
- H. A full capacity neutral bus, fully insulated from frame, shall be provided with suitable disconnect link. Provide separate ground bus in each service switch and distribution switchboard assembly.
- I. Provide floor steel channels with shims for level mounting of assemblies on floor.
- J. Provide utility metering compartment in accordance with all requirements of PSE&G.
- K. Provide for each service switch, three (3) current transformers of suitable ratio, three phase ammeter switch, and 1% accuracy analog switchboard type ammeter.
- L. Provide for each service switchboard, one (1) 1% accuracy switchboard-type analog voltmeter.
- M. Hinged rear doors shall be not more than 36 inch wide door panels with 3-point locking latches.
- N. All sheet and structural steel parts shall be rustproofed prior to painting, finished with a light gray paint, ANSI 61, on interior and exterior over all steel surfaces.
- O. Each service switchboard shall be provided with surge protection devices (SPD).
- P. All free-standing service switches shall be provided in accordance with the service switchboard section.
- Q. Provide space within service switchboard assemblies for all future utility meters where noted on drawings and/or a future service switch is indicated.
- R. Outdoor switchgear shall be provided with strip heaters and associated thermostats. Power for the strip heaters shall be provided by internal CPT with associated fuses.
- S. Service Switchboard and Distribution
Switchboard Assembly Circuit Protective Devices
 - 1. All overcurrent protective devices shall be UL listed.
 - 2. All service overcurrent protective devices for all separately derived systems, including, but not limited to, utility service, transformer secondary, generators, power conversion equipment, etc., shall be rated for 100 percent (100%) of their continuous ampere rating and shall comply with all New Jersey State Electrical Code Requirements.
 - 3. On all service disconnect devices and on distribution disconnect devices indicated on the Contract Drawings, provide a ground fault monitoring system. Each ground fault detection system shall consist of a current monitor, zero sequence current transformer relay coil and fault indication on the face of the switchboard either on the device cubicle in alarm or centrally located on the switchboard metering compartment if proper identification is provided.

4. All service switches for all separately derived systems, except for fire pumps 1,000 amps or greater, shall be provided with ground fault protection.
5. Provide two (2) pairs of isolated Form "C" contacts rated 10 amperes, 125 volts from each distribution device for remote status indication provided under other Sections. Extend Form "C" contacts to terminal strips in a separate control compartment in the switchboard.
6. Circuit Breakers
 - a. Circuit breakers shall be insulated case type for all circuit breakers 800A and larger, complete with solid-state overcurrent and trip devices and electric operators for circuit breakers 100A and larger. Circuit breakers shall be molded case type for all circuit breakers 600A and smaller, complete with solid-state overcurrent and trip devices and electric operators for circuit breakers 100A and larger. All circuit breakers, in their enclosures, shall be UL listed for application at 100% of designated frame ratings (ANSI C37.13, C37.16, C37.17 and C37.50, UL-1066, CSA C22.2). Each circuit breaker faceplate shall have visual indicators to indicate contacts' "open" and "close" positions, with a local "charge" pushbutton and an LCD display unit. An individual trip target shall be visible from the face of the device. Local control buttons shall be provided for breaker operation. Provide adjustable solid-state (digital) tripping devices for each circuit breaker, each having a complete range of tripping functions and characteristics built into its solid state module. In addition, each circuit breaker shall be equipped with a Modbus open protocol communication port. Complete system coordination shall be provided by inclusion of following time/current curve shaping adjustments:
 - Ampere setting
 - Long-time pickup
 - Long-time delay
 - Short-time pickup
 - Short-time delay
 - Instantaneous pickup
 - Instantaneous delay
 - Ground fault trip
 - b. Changes in settings shall be made by adjustment at the circuit breaker trip module or by interchangeable switching plugs for precise settings. All settings shall be sealable. This manufacturer shall submit recommended settings for all switchboards protective devices to achieve a completely selective coordinated system from the main protective device (normal and emergency service disconnect devices), through and including the critical load device (branch devices on subfed critical distribution panelboards). Submit for approval final time current curve indicating selectivity. Circuit breakers shall be rated at 65,000 rms symmetrical amperes. All circuit breakers shall be individually field-tested (primary induction testing) for proper calibration and operation by an independent testing company

retained by this manufacturer, before site acceptance testing. The independent testing company shall submit a written report of the test after all corrections and adjustments have been made.

- c. All trip units shall have integral meter readings, including 3 phase amps.
- d. Provide one (1) test kit for testing all frame sizes. The test kit shall contain all required appurtenances, including, but not limited to, harnesses, ground fault defeat modules, etc.

2.05 GROUND FAULT PROTECTION SYSTEM

- A. Where required by Code, provide a ground fault protection (GFP) system for all main service disconnect devices and distribution switches rated 1,000 amps and above. Each GFP system shall consist of a current monitor, and fault indication. All alarms will be displayed on a digital display panel (LED type). The GFP system shall be mounted on the face of the switchboard on the device cubicle in alarm.
 - 1. Ground fault protection shall be provided where indicated on the drawings and on all main service disconnect devices rated 1000 amps or larger (except fire pump).
 - 2. The ground fault protection shall consist of the following:
 - a. Current Monitor: Zero-sequence current transformer enclosing all current carrying conductors, including the neutral conductor, if used, of the circuit being protected.
 - b. Ground Fault Sensor: Senses the output of the current monitor. Should the sensor detect a ground current in excess of the pickup setting for a duration exceeding the time delay, the sensor shall shunt-trip the appropriate device. The sensor shall have an adjustable pickup of 100 to 1200 amperes and an adjustable time delay from 0 to 60 seconds.
 - c. Test Panels: Provide each ground fault sensor with a test panel which shall completely test the ground fault system. The test panel shall indicate that a ground fault was sensed or test the system with or without tripping the feeder switch or breaker. The test panel shall be installed in the front of the switchboard adjacent to the device being protected.
 - d. Shunt-Trip: Each device or switch with ground fault protection, shall be provided with a shunt-trip which shall automatically open the device when signaled by the sensor.
 - e. Provide fuse-protected central power transformer from the switchboard line side for the ground fault systems. Ground fault and shunt-trip device shall be capable of operation at 55% of rated voltage.
 - 3. Settings: The electrical trade shall set each ground fault sensor pickup setting at 25% of the rating of overcurrent device with a 6-cycle time delay unless specifically indicated otherwise in the accepted short circuit and coordination study.
 - 4. Integral, self-powered ground fault protection with mechanical ground fault indicator, test function, current sensors, and adjustable pick-up and delay with inverse and constant time characteristics. The system shall be field adjustable with pick-up settings from 100 amps

to 1,200 amps and trip signal time from 0.1 seconds to 0.5 seconds. The ground fault system shall be self-powered and shall only require external control power for test purposes. The ground fault relay shall have an internal memory circuit that sums intermittent arcing ground faults, until the summed ground fault current reaches the trip setting and opens the switch.

5. The ground fault system components shall be mounted and wired onto the circuit protective device during switch assembly, and factory tested by the manufacturer to insure system compatibility.
6. A ground fault protection monitor and test panel shall be provided as an integral part of the switch. The panel shall be visible from the front of the switchboard and shall be equipped with control power indicating light, ground fault trip indicating target, target reset and means of testing the GFP relay and trip circuit — with and without tripping the switch.

2.06 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY AND ARC-FLASH STUDY

- A. Provide a complete overcurrent protective device coordination study and arc-flash study as outlined in specification section 26 05 73.

2.07 GENERAL

- A. A minimum of three (3) spare fuses or current limiters of each type and size used in conjunction with circuit protective devices for the switchboards shall be furnished and delivered to the Owner upon issuance of a "Certificate of Substantial Completion".

2.08 FACTORY TESTING

- A. All switchboards shall be fully assembled and factory tested for full functionality at the manufacturer's factory prior to shipment as specified herein:
 1. The switchboard manufacturer shall provide a ground fault monitoring system test for verification of the trip function and alarming of the ground fault sensors at the factory location. The manufacturer shall pass predetermined values of current through the relay sensors and confirm resultant required relay operation. This test shall include a polarity verification of the interconnection of the ground sensor circuits.

2.09 FIELD TESTING

- A. The manufacturer shall provide support to the installing contractor for performance of the following field testing. Allow for a minimum of 2 man-weeks of field support.
 1. After construction work is complete and prior to energizing of the switchboard, the ground fault monitoring system shall be field tested and reset to the manufacturer's recommended setting for both current and time.
 2. Service Switchboards, Distribution Switchboards and Panelboards (in excess of 800 amperes)
 - a. Switchboards shall be megger tested.
 - b. Switches shall be operated to confirm proper mechanical operation.

- c. Test the accuracy of all meters under varying load conditions with hand-held True RMS reading multimeters.
- d. Ground fault trip/sensing systems shall be tested to verify their settings and proper activation. Polarity verification of the interconnection of the ground sensor circuits shall be performed.
- e. Primary and secondary injection testing shall be performed on all breakers.

PART 3 - EXECUTION (FOR REFERENCE)

3.01 INSTALLATION

- A. The assembled service and distribution switchboard structures shall be securely anchored to continuous 1-1/2 in. x 6 in. channels the full length of the switchboard which shall be installed on structural platform. Bolt studs shall be at least 3/8 in. in diameter and located not more than 30 in. apart center to center for switchboard mounting. The mounting channels shall be continuous one-piece structural channels mounted along the front and rear for each continuous switchboard lineup, leveled. The channel and bolt studs shall be furnished and installed by this Contractor. Manufacturer shall coordinate all mounting requirements with the contractor.

3.02 FIELD TESTING

- A. After construction work is complete and prior to energizing of the switchboard, the ground fault monitoring system shall be field tested and reset to the manufacturer's recommended setting for both current and time.
- B. Service Switchboards, Distribution Switchboards and Panelboards (in excess of 800 amperes)
 1. Switchboards shall be megger tested.
 2. Switches shall be operated to confirm proper mechanical operation.
 3. Test the accuracy of all meters under varying load conditions with hand-held True RMS reading multimeters.
 4. Ground fault trip/sensing systems shall be tested to verify their settings and proper activation. Polarity verification of the interconnection of the ground sensor circuits shall be performed.
 5. Primary and secondary injection testing shall be performed on all breakers.

END OF SECTION

SECTION 26 32 13.13 - DIESEL ENGINE-DRIVEN GENERATOR SET

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish and deliver a complete standby rated diesel engine generator (DEG) set, including all associated automatic controls, monitoring, load banks, output distribution, captive fuel oil storage, acoustic enclosure, and appurtenances for a complete, operational system as specified herein and required for backup of emergency (E) Legally required (LR) and optional standby (OS) systems throughout the project, as indicated on and in accordance with the requirements of the Contract Documents.
- B. Section Includes:
 - 1. System Operation.
 - 2. Diesel Engine-Generator Set.
 - 3. Generator.
 - 4. Cooling System.
 - 5. Sound-Attenuating Enclosure.
 - 6. Sub-Base Day Tank.
 - 7. Local Indicator Control Panel (LICP).
 - 8. Distribution Overcurrent Protective Devices.
 - 9. Remote Annunciation.
 - 10. Radiator mounted Load Bank

1.02 RELATED DOCUMENTS

- A. The following specification sections apply to all Work herein:
 - 1. Section 26 05 03 - Electrical Pre-Purchase General.
 - 2. Section 26 05 73 - Overcurrent Protective Device Coordination Study and Arc Flash Study.
 - 3. Section 26 36 23 - Automatic Transfer Switches.

1.03 REFERENCES

- A. The diesel engine-driven generator set and all components shall be designed, manufactured, and tested in accordance with the latest applicable codes and reference standards, including the following:
- B. Codes:
 - 1. BCSNJ - Building Code of the State of New Jersey.
 - 2. NFPA 101 - Life Safety Code.
 - 3. NFPA 110 - Standard for Emergency and Standby Power Systems.
 - 4. SNJEC - State of New Jersey Electrical Code.
- C. Reference Standards:
 - 1. ANSI.

2. EGSA - Electrical Generating Systems Association Standards.
3. IEEE 446 - Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications.
4. IEEE 493 - Design of Reliable Industrial and Commercial Power Systems.
5. NEMA MG 1 - Motors and Generators.
6. NEMA MG 2 - Safety Standards and Guide for Selection, Installation, and Use of Electric Motors and Generators.
7. UL Standard 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
8. UL Standard 1236 - Battery Chargers for Charging Engine-Starter Batteries.
9. UL Standard 2200 - Stationary Engine-Generator Assemblies.

1.04 SUBMITTALS

- A. The following submittal data shall be furnished according to the Conditions of the Construction Contract, General Conditions and Section 26 05 03 and shall include, but not be limited to:
1. Technical proposal, including specification and description of all components, equipment and operation including manufacturers of all major components and equipment.
 2. Completed technical data bid analysis and rating forms (see Appendices).
 3. Set of drawings indicating system's configuration and dimensioned physical layout within allocated space. This shall include all output, control, and distribution equipment.
 4. Provide a detailed schedule with key milestones identified (e.g., shop drawing submission dates, approval dates required, completion of fabrication, factory testing, etc.) to achieve the rigging date.
 5. PE stamped calculations by a qualified New Jersey registered engineer showing compliance with seismic forces per Code.
 6. Qualifications.
 7. Alternate physical layout, where appropriate.
 8. Shipping method and crating description including method and extent of equipment protection during shipping as well as on-site after rigging.
 9. Details of rigging and diesel-generator subassembly.
 10. Details of mounting requirements.
 11. Warranty statements.
 12. Factory acceptance test procedure.
 13. Site acceptance test procedure.

- B. None of the technical data required with the technical proposal shall be construed as “shop drawings”, nor will they fulfill the contractual obligation for submission of “shop drawings” as stated in the Contract Documents.
- C. Provide the following information on service and maintenance:
 - 1. Locations of factory-authorized service capability, number of full time factory trained personnel at each location, and specific experience on diesel engine-generator, including skill levels.
 - 2. Location and response time of local service organization providing primary service to the facility. The response time shall be considered the interval between the initial request and the time that the representative arrives on the site. The maximum acceptable response time is two hours. Include listing of spare parts that are stocked at the local service location.
 - 3. Escalation procedures if problems fail to be resolved.
 - 4. Recommended preventive maintenance tasks and intervals.
 - 5. Price list of a complete list of spare parts, with notation of recommended spare parts, that the Owner should maintain on site for the entire DEG system (including circuit breakers) to ensure minimum downtime for repair. If any of these parts has a limited shelf life, it shall be identified. Include price list for additional recommended spare parts.
- D. Compliance with all commitments made by this Contractor, including, but not limited to, submissions, scheduling, fabrication, delivery, testing, etc., including all component elements required by these Contract Documents, including those outsourced, is the sole responsibility of this Contractor.

1.05 SHOP DRAWINGS

- A. Prepare and submit for review, detailed shop drawings for the equipment provided herein. In case of question, the Owner's representative will be the final judge as to the requirement for shop drawings for specific areas of work.
- B. Provide a matrix with all adjustable time delays, their adjustability range and their associated factory or recommended settings for review.
- C. Where standard catalogue cut sheets or documentation covering a variation in size, type or performance of similar or related equipment are submitted as part of the package, the specific item proposed to be provided shall be highlighted to avoid misunderstanding as to the intent.
- D. Where custom manufactured equipment such as local indication and control panels (LICP's), output distribution device switchboards, and extended generator endboxes are provided, the drawings shall include front elevations, rear elevations, sections through each frame showing all horizontal and vertical bus work, internal barriers, components and bracing. Drawings shall include bus material, size, and phasing, location of all potential transformers, current transformers, transducers, terminal block, instruments, switches, meters, PLC, etc. Provide all dimensional data, weights, shipping splits and arrangement of all equipment components.

- E. All submittals shall be a complete package properly indexed and cross-referenced. All pages shall be sequentially numbered.
- F. Submittals shall contain all required and detailed information for all components of the system, including all necessary wiring diagrams and/or interconnecting cable schematics for connection of the diesel engine-generator, associated distribution devices, controls, and auxiliaries. The interconnect diagrams shall be composite drawings for all components and shall indicate wiring and termination points for all cable. Show all contiguous construction related to the mounting of equipment for the coordination of other Divisions.
- G. Assume total system responsibility for all components and associated controls and be responsible for coordination of all system components.
- H. The review of any submitted data or shop drawings for material, equipment apparatus, devices, arrangements and/or layout shall not relieve the manufacturers from the responsibility of furnishing same of proper dimensions and weight, capacities, sizes, quantity, quality and installation details to efficiently perform the requirements and intent of the Contract Documents. The review shall not relieve the manufacturer from responsibility for errors of any sort on the submitted data or shop drawings.
- I. After final review of the shop drawings, the manufacturer shall furnish to the Owner a complete, reproducible, corrected, set of the shop drawings, corrected to include all comments developed in the review. Two sets of black-and-white prints of the same drawings and a compact disc with the files in the latest version of AutoCAD shall be submitted to the Owner for record.
- J. Upon resubmission of shop drawings, a cover letter shall address all comments made by the Engineer and/or Architect (referenced by page, paragraph, etc.). Resubmissions shall be complete and include all of the previous submissions documentation and any additional information. New information shall be submitted as part of an appendix, and shall be cross-referenced on the appropriate page within the submittal. Highlight all changes to the prior submission.

1.06 OPERATING AND MAINTENANCE INSTRUCTIONS AND MANUALS

- A. Ten (10) sets of operating and maintenance instructions and manuals, covering completely the operation and maintenance of the equipment provided hereunder, shall be submitted to the Owner. Ten (10) sets of parts lists and manuals for each item of equipment shall be furnished to the Owner. Maintenance manuals shall outline all necessary periodic functions required and shall include a recommended system for keeping logs and records. Include troubleshooting charts, schematics of all assemblies and wiring diagrams, in sufficient detail and clarity to enable the Owner's technicians to understand, operate, and maintain the system.
- B. Provide a minimum of 24 hours of operating and maintenance instruction for eight (8) building operators, with personal on-the-job instruction by factory trained engineers representing the diesel engine-generator manufacturer and controls manufacturer. This instruction shall be scheduled at time(s) convenient to the Owner's personnel. Instruction shall cover all equipment and systems provided under this Section. The number of hours is a minimum requirement; where additional hours are specified in other paragraphs of this Section, those hours shall be additive to the minimum above. Instruction shall be comprised of both classroom type and

actual hands-on operating experience. Submit an outline of the instruction program and instruction manual to the Owner for his approval at least two weeks prior to the proposed start date of the instruction sessions. The Owner will videotape all instruction sessions for purposes of future training. Provide a review and written critique of the Owner's videotape within one month after completion of the instruction sessions and receipt of the Owner's videotapes. The critique shall correct all mistakes and clarify all outstanding questions which arise during the sessions.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the requirements of the General Conditions and Section 26 05 03

1.08 WARRANTY

- A. All equipment shall be new, of first class material, and of latest approved design. Workmanship shall be of the best quality, free from any defects that might render the equipment unsuitable or inefficient for the purpose for which it is to be used.
- B. The manufacturer shall warranty his equipment to meet the performance conditions specified for the period of time which is normal industry practice for this type of equipment, but in no case for less than from the substantial completion until two years thereafter. If the standard warranty period is longer, state this in the technical proposal.
- C. Two-hour response field service assistance shall be available on a 24 hour, 7 day a week basis from each manufacturer or his authorized representative in the New York Metropolitan area.
- D. Comply with the requirements of the General Conditions and Section 26 05 03.

1.09 SPARE PARTS

- A. Provide a complete list of spare parts for all equipment being provided as part of this Section (i.e., including circuit breakers) with notation of all recommended spare parts to be kept on site for repair and replacement during the first 600 hours of operation, including, but not limited to, the following: Air filters, oil filters, fuel filters, spare bulbs, spare jacket water heater element, anti-freeze inhibitor, inhibitor test kit, oil sample kit, etc., special tools required for repair and replacement, and a storage cabinet to house the above.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Furnish and deliver a complete, diesel engine-driven generator set and power distribution and control system for operation as a standalone plant with one (1) 200 kW/250 kVA, 80% p.f. diesel engine-generator in an acoustic enclosure with belly-mounted fuel oil tank and radiator-mounted 100 kW load bank, EPA Tier 2 rated, for backup of emergency and optional standby loads.

- B. Generator system shall be equipped with all necessary operating accessories, such as AC generator, radiator fan, fuel pumps, water pumps, starting systems, local and remote control equipment, and safety devices. The control system shall be capable of sensing the loss of the normal source through the automatic transfer switches, which shall initiate the start of the engine-generator set within 10 seconds of the start signal.
- C. Furnish and install exhaust silencers, scrubbers/silencers and flexible connections to the exhaust manifolds, as well as the exhaust piping from the silencers, including elbows, wall flanges and supports.
- D. The engine-generator shall be capable of operation with low sulfur fuel.

2.02 ACCEPTABLE MANUFACTURERS

- A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment which does not comply with the performance and/or physical characteristic requirements of the Contract Documents.
- B. If it complies with the Contract Documents, diesel engine-driven generator sets manufactured by one of the following manufacturers will be acceptable:
 - 1. Caterpillar.
 - 2. Cummins/Onan.
 - 3. Detroit Diesel.
 - 4. Or approved equal.
- C. If it complies with the Contract Documents, resistive load banks manufactured by one of the following manufacturers will be acceptable:
 - 1. Avtron.
 - 2. Loadtec.
 - 3. Professional Power Products Inc.
 - 4. Simplex.
 - 5. Or approved equal.
- D. If it complies with the Contract Documents, acoustic enclosures manufactured by one of the following manufacturers will be acceptable:
 - 1. International Supply Company.
 - 2. Professional Power Products, Inc.
 - 3. Robinson.

4. Or approved equal.

2.03 SYSTEM OPERATION

A. Automatic Mode

1. When the system control switch is placed in the "auto" position, the loss of normal utility service as sensed at any of the automatic transfer switches shall cause the diesel engine-generator set to start.
2. The diesel engine-generator on-line signal shall cause all automatic transfer switches designated as Priority One to transfer to the "emergency" position, if the normal source is not available within acceptable limits at the utility terminals of the automatic transfer switch.
3. Where more than one automatic transfer switch is assigned to any priority, all the transfer switches within that priority shall not transfer simultaneously. An adjustable time delay (0-60 seconds) shall be provided for each subpriority (up to 10 automatic transfer switches per priority) to allow sequential transfer of each automatic transfer switch to the emergency position. Each transfer switch shall be assigned a critical transfer priority number. The automatic transfer switch with the lowest critical number within the priority level set shall be the first device to transfer. All remaining automatic transfer switches shall transfer in order of their critical number after a time delay as assigned by the subpriority control system.
4. The failure of the generator shall transfer all loads to an "off" emergency position by returning the switch to the neutral position of the transfer switch.
5. Automatic transfer switches that have been shed due to engine failure or prohibited from transferring to the emergency position due to the failure of the diesel engine-generator set to start, may be manually added or returned to the system by operation of the override switch for each automatic transfer switch, including Priority One. This operation shall immediately cause the automatic transfer switch whose priority level has been bypassed to re-close to the emergency position with an indicating lamp providing positive verification that the operation has been completed..
6. Upon restoration of the normal source within acceptable limits at the automatic transfer switches, loads shall be retransferred to the utility in a manual manner. After the expiration of an adjustable engine cool-down time delay (0-30 minutes) provided as part of the generator control system, the diesel engine-generator may be manually shut down (return to normal service via manual control). All controls shall automatically reset for the next operation, and the priority selector system shall be deactivated with all bypassed priorities returned to their original priority position.

B. Test Mode

1. When the generator is on-line, the load bank circuit breaker shall be permitted to close from the LICP. The control switch shall be a momentary control switch.

2. In this mode of operation, additional loads other than the load bank may be selectively added to the generator by activating the bypass mode of the priority selector switch associated with the desired transfer switch. One switch per ATS shall be provided. This operation shall immediately cause the load to transfer to the generator source with an indicating lamp providing positive verification that the operation has been completed. Activation of any impending failure alarm, or the increase in load beyond the predetermined level or the failure of the diesel engine-generator will automatically cause the automatic transfer switches to return to their normal position. In this mode of operation, the load bank is assumed to be the Priority One load in lieu of the building emergency loads.
 3. Returning the system control switch to the "auto" position shall cause all loads then connected to the generator to retransfer to the normal source using the return to normal time delay on the automatic transfer switches to sequence the return. The load bank circuit breaker is to be considered the Priority One transfer switch in this mode and shall open. After the expiration of the system engine cool-down timer, all controls shall automatically reset for the next operation, and the priority selector system shall be deactivated with all bypassed priorities returned to their original position.
 4. Loss of the normal source of supply while operating the system in this mode shall cause the load bank circuit breaker to open and place the automatic transfer switch priority system in the automatic mode, while maintaining the running status of the generator.
- C. Weatherproof break-glass type switch(es) shall be provided on the diesel engine-generator enclosure, to be located at the entrance(s). These stations shall be wired to immediately shut down the respective diesel engine-generator and open its output circuit breaker and shall parallel the emergency stop pushbutton located in the LICP. Provide a phenolic nameplate with 1 inch high red letters on a white background indicating diesel engine-generator number and "Emergency Stop of Generator".
- D. Activation of any "stop" or "lockout" command from the system described herein shall cause, in addition to electrically shutting down the diesel engine-generator, the normally closed fuel oil supply solenoid valve to close.
- E. The diesel engine-generator shall contain a generator-mounted local indicator and control panel. This panel shall contain a switch labeled "automatic-run-stop". From this position, it shall be possible to control the diesel engine-generator (except when the "emergency stop" pushbutton has been activated).
1. When the switch is placed in the "auto" position, the diesel engine-generator shall operate automatically when called for by the generator start system.
 2. When the switch is placed in the "run" position, the diesel engine-generator shall start and run. Loss of the normal source of supply, while operation in the "run" position, shall cause an alarm to sound at the LICP while maintaining the running status of the diesel generator and allow load to be transferred to the generator via the transfer switches. When the local load bank circuit breaker is in the closed position, a shunt trip signal shall be sent to the load bank circuit breaker and the diesel engine-generator shall assume load as hereinbefore described.

3. When the switch is in the "stop" position, the diesel engine-generator shall be locked out. Whenever the key switch is placed in the "stop" position while the diesel engine-generator is on-line and operating, the circuit breakers shall open, and it shall allow a normal shutdown with a time delay to allow the engine to cool after operating under load.
 4. The LICP shall contain a separate "emergency stop" pushbutton. This switch shall be a mushroom type, push-to-activate and be colored red. Activation of this maintained contact switch shall cause the operation as described above for the "stop" position of the local panel key switch, except the diesel engine-generator shall stop immediately without a cooldown time delay. The control circuit associated with this switch shall not permit further operation of the engine-generator from the LICP until the device is manually reset.
- F. Placing the system selector switch in any position other than the "auto" or "run" position shall cause a red light, located in the LICP, to flash at one second intervals, and remote signal to be transmitted to the building management system, indicating an abnormal condition. A Form "C" isolated contact rated 10A, 125V shall be provided for this purpose, to be extended under other Divisions.

2.04 DIESEL ENGINE-GENERATOR SET

- A. The diesel engine-generator shall be capable of developing sufficient horsepower to deliver the specified kW at 80 percent power factor when equipped with all necessary operating accessories, including (engine-mounted radiator) and load bank, auxiliary pumping equipment, and fuel oil pump, and when operating under the following conditions:
1. Standby power rating with outside ambient temperature of 0°F to 120°F, 0-100% relative humidity.
 2. At an elevation of 1000 feet above sea level.
 3. Room combustion air temperature of 120°F maximum, 0° F minimum.
 4. Generator speed not to exceed 1800 rpm maximum at full load operation.
 5. The net combined output rating shall include all derating due to ambient conditions noted above and any derating due to elevated fuel oil temperatures in excess of 90°F.
 6. The diesel engine-generator shall provide the output rating with an exhaust system including flexible connections for all piping, exhaust silencer and flue pipe having a maximum of 10 in. of water back pressure after the silencer.
- B. The diesel engine shall be a full compression ignition engine, four stroke cycle, water cooled solid injection, suitable for operation with No. 2 diesel oil. The engine speed shall not exceed 1800 rpm at normal full load operation.
- C. The governor shall be speed sensing, capable of maintaining accurate engine speed control for any load from open circuit to full rated load, and shall be electronic, Woodward Model 2301A. The frequency at any constant load, including no load, shall remain within a steady state band of $\pm 0.25\%$ of rated frequency. Frequency modulation shall not exceed one cycle per second for

the addition of full load with a voltage dip not to exceed 20% of nominal voltage. The frequency regulation from no load to rated load shall be in accordance with that defined by diesel engine-generator performance. For any addition of load up to 100% of rated load, the frequency shall recover to the steady state frequency band within 5.0 seconds.

- D. Replaceable element dual fuel filters shall be engine mounted and convenient for servicing. Dual fuel filters shall enable replacement of either one of the elements with the diesel engine-generator under full load operation.
- E. Engines shall have dual water separators with alarm contacts. Provide single lever actuation for transferring between the dual filters and dual water separators with contacts for remote indication.
- F. The unit's fuel oil system shall be configured as follows:
 - 1. The unit's fuel supply line shall be equipped with a normally closed 24 VDC solenoid valve with manual override for unit isolation. The solenoid valve shall prevent oil pressure from the supply header above from acting on the engine when engine is off. The solenoid valve shall be immediate opening, time delay (adjustable) closing.
 - 2. The fuel oil return line shall be equipped with a check valve as a prevention from loss of prime as well as a ball valve for unit isolation. (The check valve shall be oiltight and shall prevent the oil pressure from the return line above from acting on the engine when engine is off.)
 - 3. Each valve installed for unit isolation shall be equipped with a tamper switch wired to a terminal block in the local control panel for connection to a remote alarm provided under another Division.
 - 4. The engine fuel oil pump shall have the capability of discharging the return oil to a fuel oil return pipe located 12 feet above the bottom of the generator rails.
 - 5. Fuel oil piping, solenoid valves, check valves, and isolation ball valves, external to the unit shall be provided under another Division. All control wiring shall be provided by this Contractor.
- G. The engine shall have a lubricating oil pump for supplying oil under constant pressure to main bearings, piston pins, timing gears, camshaft bearings, crank pin bearings, and valve rocker mechanism. Provide an oil makeup system with 10 gallon reserve lube oil reservoir for automatic lube oil makeup including reservoir lube oil level sight glass and low oil level and high oil level alarm switches wired to a terminal block in the generator local control panel for connection to a remote alarm at the LICP.
- H. A full flow shell and tube fuel oil cooler with automatic bypass valve shall be provided to ensure proper oil cooling.
- I. A crankcase fumes recovery system shall be provided similar to the air-separation system, which includes air cleaners, valves and piping which recovers all fumes and return to engine intake.

- J. Provide for the engine stainless steel flexible exhaust fitting and supercritical (hospital) type Maxim, Nelson (Donaldson) or Burgess-Manning (or approved equal) silencer (minimum 75 dBA at a distance of 5 feet 0 inches beyond the attenuated muffler discharge pipe in fully installed position; selection is responsibility of manufacturers). Provide exhaust outlet pipe and insulation within acoustic enclosure. The resulting available backpressure for the system, after silencer losses, shall be at least 16 inches of water, with a maximum allowable pressure loss across the silencer not to exceed 40% of the maximum backpressure capacity of the diesel engine-generator.
- K. Provide an engine block heating system complete with contactor, thermostat accessories and wiring to a terminal box on the generator. The heater shall be a size as recommended by the engine manufacturer to ensure quick automatic starting of the set in an ambient temperature of 0°F. Heaters shall be suitable for operation at single-phase, 480 volt, 60 hertz. All heater hoses shall include a reinforcing flexible jacket of stainless steel, Kevlar, or other approved equivalent.
- L. Provide a suitable filter, to filter all outdoor air for combustion. Filter shall be dry type, replaceable element. Filter shall have air restriction gauge.
- M. The engine shall be started by means of a 24 volt DC automatic starting system. There shall be an engine starting motor, capable of starting the engine. The starting motor shall be of the heavy duty type and shall automatically disconnect upon engine startup.
 - 1. The automatic starting control shall be actuated by contacts in the automatic transfer switches.
 - 2. Provide a manual switch to select the "lead" battery system.
 - 3. Provide nickel cadmium batteries as manufactured by Nife, Inc., Alcad or approved equal, complete with steel rack, necessary cable and connectors, all in conformance with the engine manufacturer's requirements. Batteries shall provide a minimum of 240 seconds of continuous crank in an ambient of from 0°F to 120°F.
 - 4. For maintenance of batteries at 90-100% of full charge, a temperature sensitive automatic two-rate type battery charger, Lamarche, Nife, Simms, or as approved, shall be provided for the engine's starting battery system. The automatic charger shall be capable of charging the batteries and the charger shall recycle automatically to high rate after a discharge. The charger shall be complete with DC ammeter, voltmeter, individual float and equalize adjustments, on-off switch, DC fuse and charging indicator light and shall be suitable for operation on a 120 volt circuit. Charger shall automatically current limit during the engine cranking cycle. Provide two sets of Form "C" contacts rated 10 amperes at 120 volts for remote indication of the chargers low DC voltage and AC power failure alarms. The alarm initiation shall have an adjustable time delay to compensate for loss of normal power. Provide circuit for charger from a local panel.
 - 5. Provide all interconnecting conductors as required and recommended. All prewiring on each machine that is furnished and installed by the engine-generator manufacturer shall be installed in a suitable raceway system consisting of properly organized junction boxes, flexible metal and/or sealtite conduit raceways, termination boxes with terminal blocks with wiring identifications and all additional appurtenances, fasteners, hardware, etc.,

needed to achieve a neat and orderly arrangement of all branch circuit components formed into a consistent pattern.

- N. The engine shall be equipped with sensors which will shut down the engine and prealarm sensors indicating the approach to specified settings, all as listed hereinafter.
- O. Provide a crankcase explosion relief valve or vented crankcase for each engine.
- P. The engine-generator set shall be provided with a structural steel base. The base shall have sufficient rigidity to accept seismically rated spring type isolators, provided under this Division, beneath the entire unit between it and structural support. Spring isolators shall be provided in quantities determined by a qualified vibration isolation vendor to permit a minimum static deflection of 3 inches. Mountings shall incorporate a leveling device, vertical limit stops, seismic restraints and single layer of 3/4 inch Super W type pad. The mountings shall be installed directly under the structural steel base and shall be positioned to accept the weight and weight distribution for uniform mounting deflection. Spring isolators shall be similar to Mason Industries, Inc., Type SLRS, or as approved, and rated for seismic rating described in other Sections. Pads shall be similar to Mason Industries, Inc., Super W, or as approved. The vibration isolators shall not have a surge or neutral frequency within $2\sqrt{2}$ of any operating speed of the engines. The manufacturer shall coordinate installation requirements with the installing contractor.
- Q. The line-side of the circuit breakers shall be bused to a common input bus, which shall be constructed of copper with either silver or tin plating at all joints. Bolted joints shall consist of silver or tin plated copper splice plates and high tensile strength steel bolts, with nuts and Belleville washers tightened to the proper torque. Bus bars and the enclosure shall be sized to meet the requirements of UL 891 and shall be braced to withstand resulting mechanical forces exerted during short circuit currents, but no less than 100,000 amperes rms symmetrical.
- R. Adequate conduit space shall be provided in the rear compartment of the compartments to satisfy the current ratings of the individual devices and the input from the generator. All cable terminations shall be made with two bolt hole concentric compression type copper bodied long barrel lugs which shall be identical to the lugs provided in the emergency switchboard.

2.05 GENERATOR

- A. The generator shall be a four lead machine of required kW rating as hereinbefore specified, 0.8 p.f., 3 phase, 4 wire, with grounded neutral, 60 hertz, 277/480 volt, 1,800 rpm, with Class H synthetic nonhygroscopic fungus-resistant insulation.
- B. Maximum allowable temperature rise shall be 80°C rise over 40°C ambient.
- C. Generator shall be of the heavy duty, air cooled brushless revolving field type, with regreasable ball bearing(s), dripproof construction, close-coupled directly to the engine flywheel through a flexible drive disc for positive alignment.
- D. Generator shall be capable of maintaining the rated output voltage at the terminals of the generator with a maximum total harmonic voltage distortion of 5 percent when a 100 percent nonlinear six-pulse rectifier current load profile having a 3 to 1 crest factor is applied at the

terminals of the generator. Subtransient reactance shall not exceed 12% at specified load requirement.

- E. The exciter shall have sufficient capacity to provide ample excitation to the generator under all normal load conditions, including motor starting, and shall be of the permanent magnet type.
- F. The voltage regulator circuiting must be protected by a thermal breaker and also be inherently protected from prolonged undervoltage and underfrequency periods. The regulator power circuit shall be isolated from the distortion that occurs when the generator supplies a non-linear load.
- G. The instantaneous voltage drop shall not be greater than 20% of rated voltage when full load at rated power factor is applied to the generator, nor greater than 15% of rated voltage when any increment of 75% of full load at rated power factor is applied to the generator.
- H. Frequency modulation shall not exceed one cycle per second for the load steps previously noted and 0-5 cycles per second for 33 percent step-load at 5 second intervals with a maximum 20% voltage drop.
- I. Stable operating conditions shall be reestablished within five seconds following any sudden change in load between no load and full load or between full load and no load. Stable generator operation is defined as operation with terminal voltage held constant within plus or minus 1% of rated voltage.
- J. Steady state frequency regulation shall be maintained within 0.5% of 60 Hz.
- K. Windings shall be braced to withstand the maximum available line-to-line or line-to-neutral short circuit current.
- L. The generator shall be provided with output termination wiring chamber, which shall contain copper bus bars of adequate size and spacing, with a minimum of eight (8) inches between phases and between phase and ground, so as to be able to properly terminate the load side cables. Provide solderless copper bodied, long barrel, concentric compression type 2 bolt-hole lugs. The wiring chamber shall be suitable for top or bottom entry of cable and conduit and shall be of sufficient size for termination of cable and installation of current transformers. The generator bus bars shall be arranged to be compatible with phase rotation sequence of the normal supply service. The box shall be mounted on either side or top as required. A grounding pad shall be provided.
- M. Calculations must be submitted with the proposal response to demonstrate generator specification compliance.
- N. Stator: Windings shall be form wound and be of 2/3 pitch design. All insulation shall have a minimum hot spot rating of 155°C and be of an epoxy resin type. Stator frame shall be fabricated bar and plate steel construction. The windings shall be braced to withstand single and three phase fault conditions
- O. Rotor: The rotor shall be a fully laminated, salient pole design. Cooling fan(s) shall be an integral part of the rotor assembly. Rotor shall be dynamically balanced according to NEMA Std. MG1 and ANSI 2.19 (1989) except that the maximum amplitude will be .001 in. peak to

peak. Rotor shall be braced to withstand overspeeds of 25% over synchronous speed. All insulation shall have a minimum hot spot rating of 155°C and be of an epoxy resin type.

- P. Exciter: The exciter shall be a high-frequency, direct-connected rotating brushless type. It shall be three phase, fullwave and be matched with rotor and voltage controller. The rotating part of the exciter including the rectifier assembly shall rotate together with the alternator rotor as a complete assembly on one shaft. The exciter field leads shall be terminated on a terminal strip. All insulation shall have a minimum hot spot rating of 155°C and be of an epoxy resin type.
- Q. PMG: The rotor/exciter shaft shall include a permanent magnet type alternator to provide power for the voltage regulator. The PMG stator output leads shall be brought out to a terminal strip. The stator power output shall be matched to the voltage regulator requirements. All insulation shall have a minimum of 155°C and be of an epoxy resin type.
- R. Space Heater: A 120 VAC space strip heater suitable to reduce condensation shall be fitted on the stator frame and shall be accessible for field replacement. Power leads shall be brought to a terminal strip in the auxiliary terminal box. Provide indication in the LICP for the status of the space heater.
- S. Voltage Regulator: Voltage regulator shall be matched to exciter and alternator and be totally solid-state, including voltage buildup circuit. Overexcitation protection due to loss of sensing voltage shall be provided. It shall include field adjustable underfrequency protection using a volts per hertz function. The regulator shall have three-phase true rms sensing isolated from the power input. Stability and voltage range shall be mounted on the regulator and be easily accessible with provisions for remote voltage level control. Voltage shall be maintained to $\pm 1\%$ of rated voltage from no load to full load with no more than $\pm 0.5\%$ of rated voltage within a 40°C change in operating temperature. Remote voltage level rheostat shall provide adjustment of $\pm 10\%$. Voltage regulator shall be bench tested with varying sensing voltages for a 48 hour burn-in period.

2.06 COOLING SYSTEM

- A. The cooling system shall consist of a vertically mounted radiator, fan, engine-driven water circulating pump and all accessories pertaining thereto. The system shall have sufficient capacity for cooling the engine under full load conditions at an ambient temperature of 120°F. Provide permanent type antifreeze for -25°F protection. The radiator fan shall be capable of overcoming 1.0 inch of water column static pressure external to the unit, including its radiator.

2.07 SOUND-ATTENUATING ENCLOSURE

- A. Provide a new sound-attenuating enclosure for the engine-generator set and associated controls which shall limit the sound level to no more than 75 dBA when measured at 5 feet from any side, top or bottom, including entry doors, hot gas discharges and any penetrations for conduits, etc., under all operating conditions.
- B. The enclosure shall be constructed, as a minimum, as follows:
 - 1. Four inch thick panels of bolted together construction.
 - 2. All panel exterior surfaces, corners, floor deck plates, roof, aprons, and all miscellaneous angles and fittings shall be 14 gauge (minimum) aluminum.
 - 3. All interior perforated surfaces shall be 22 gauge (minimum) aluminum or galvanized steel.

4. Each panel shall have full aluminum or galvanized steel framing of 14 gauge, and studs no more than 24 inch on center. Stiff-ended wall panels are not to exceed 24 inch width.
5. The panel cores are to be 100% filled with fireproof 3-1/2 inch thick mineral fiber sound-absorbing material having a flame spread of 10 or less, with fuel contributed as 0 and smoke developed as 0.
6. The enclosure system shall be designed to be a skin-tight type. The floor shall be covered with minimum 7 ga. steel diamond plate decking with 1/4 inch plate at bottom. The enclosure shall be designated to remain structurally intact during normal transport and rigging, with no loss of shape or weather integrity. The enclosure base shall be furnished with "I" beams sized and spaced as required.
7. The manufacturer shall submit details of construction materials and methods together with octave band calculations detailing the performance of each element and showing compliance with the acoustical objectives.
8. The enclosure shall have a minimum of four 36 inch x 80 inch prehung, full 4 inch thick, insulated soundproof doors, fully gasketed all around on all four (4) flanged edges. The door assembly shall be hung in a welded 4 inch thick modular frame assembly. The door leaf shall be of the same 14 gauge construction as the wall panels. The door shall have three (3) galvanized steel, solid 3/8 inch diameter fast pin industrial type for severe service. The door latches are to be chrome plated heavy duty steel, for severe service, and they are to have roller catches, with adjustable striker plate.
9. The air intake and discharge louvers and sound traps shall be of adequate size to ensure minimum air restriction to the diesel engine-generator. The louvers on the enclosure shall be arranged and designed to prevent leakage. Airflow through the louvers and sound traps shall be limited to 1,000 fpm. Air intake and discharge configuration shall be as indicated on the drawings.
10. Provide fail-safe intake louvers of the "spring open, motor close" type.
11. Provide gravity type discharge louvers.
12. Provide access hatches as required for inspection and maintenance of each louver motor and spring mechanism as well as any other device requiring maintenance access.
13. Provide stainless steel floor drains with stainless steel screw caps for maintenance of each enclosure. The drains shall be placed to allow for proper drainage of the enclosure.
14. The fuel supply line shall be equipped with shutoff valve for unit isolation solenoid valve for unit operation and a "fusible link", Firematic valve for fuel shutoff. The fuel oil return line shall be equipped with a check valve as a prevention from loss of prime as well as a gate valve for unit isolation. Both supply and return piping shall be equipped with stainless steel flexible connections. Fuel oil pipe to be black seamless steel A53 Schedule 40 with malleable iron fittings. Fuel tank vent lines shall extend outside enclosure.
15. All valves shall be ball valves with tamper switches with Form "C" contacts.
16. Provide adequately sized conduit stub-up areas in floor of enclosure for generator power conduits, engine-generator control wiring and enclosure auxiliary 120/208 volt, 3 phase, 4 wire load center with bolt-on type breakers.
17. Muffler and exhaust pipes shall be insulated at the factory and installed inside the enclosure.
18. Enclosure shall contain two (2) (minimum) summer ventilation fans (with necessary louvers) and thermostat, two (2) minimum space heaters complete with thermostats to maintain a 60°F interior ambient condition with 0°F outside temperature, two (2) (minimum) DC emergency battery lights. Provide a 120/208V panelboard to supply power to all devices associated with the generator and generator enclosure. Panel shall

- have a 3P-50A main circuit breaker with associated bolt-on type circuit breakers. All wiring devices and fixtures shall be weatherproof. All generator enclosure devices (lights, heaters, receptacles, etc.) shall be completely wired and piped in galvanized rigid steel conduit to panelboard.
19. Enclosure shall have a sheetmetal wall between radiator and enclosure wall.
 20. Provide weatherproof emergency generator break-glass switches in NEMA 3R enclosures located at the exterior of generator enclosure at strike side of each door. Provide phenolic screw type red nameplate with white lettering (1 inch high) to read "EMERGENCY STOP OF GENERATOR". Operation of this switch shall immediately shut down the diesel engine-generators and trip open all output circuit breakers.
 21. Oil and water drains with 3/4 inch bronze valves shall be provided and terminate at the floor of the unit, at the exterior wall with access from outside the enclosure. A crankcase fumes disposal line shall also be piped from the engine to the outside of the enclosure. Oil and water drains shall be individually labeled.
 22. Base and Under Frame: Two (2) wide flange structural I-beam or channel iron main runners, spanning the full length of the enclosure, must be used. Formed sheet metal or plate bases shall not be allowed. Gross members must be fabricated of structural carbon steel and placed on centers to carry floor loads as required. Under no circumstance shall OSB plywood be allowed as any part of sub-base structure. Floor will be 3/16 in. diamond deck floor plate. Base will be equipped with threaded ground bosses for customer site grounding connections. Base must be able to carry internal loads applied without relying on site structures to provide additional support. Base must be designed to support internal loads on cross beams. No light-duty, top-mounted crossbeams that rely on transferring load to exterior edge of frame or base shall be allowed. Base must be designed to be perimeter supported only. Base must incorporate side acoustical insulated panels on engine section of base equal to ISCO-8364-SAIP. Provide adequately sized conduit stub-up areas with removable cover plates in floor for generator power cable, engine-generator control wiring and the enclosure panel board. A voltage rated ground strap must be supplied from the generator sub-rail to the enclosure sub-base frame.
 23. Entire enclosure shall withstand a rigidity wind test equal to 115 mph and be capable of supporting a roof load of 50 lbs. per sq.ft. minimum, in addition to other roof-mounted elements.
 24. A minimum of four (4) steel lifting rings shall be welded and bolted to assembly for the maximum combined lifting weight. Integral leveling jacks shall be provided to support total system weight.
 25. Should the unit not pass the acoustical tests, the manufacturer shall undertake all measures necessary to comply. They shall then conduct additional factory tests as described above and shall be responsible for paying time and expense associated with the Engineers' and Acoustical Engineers' witnessing of such tests.
 26. Following complete installation at the project site, the manufacturer shall conduct controlled tests to demonstrate and verify that the acoustical objectives have been met. Any and all measures required to comply with the acoustical requirement objectives shall be implemented by the manufacturer at their expense.

2.08 SUB-BASE DAY TANK

- A. Provide a 330 gallon day tank incorporated into base of enclosure with the following features.

1. General: The tank shall be constructed in accordance with the current edition of UL Standard UL 142 and the following description.
 2. Gaskets: Gaskets shall be listed gasket material minimum 1/8 inch thick.
 3. Provision for Venting
 - a. Each tank, both primary and the secondary, shall have provision for normal and emergency venting. The vent sizes will be calculated using 100 percent of the wetted surface area of the four sides and the bottom; the top is excluded.
 - b. The vent openings shall be identified and be in addition to filling, withdrawal or monitoring openings. Fittings shall be constructed in accordance with the Standard UL 142.
 4. Additional Openings: Separate openings shall be provided in the top of the tank above the normal maximum liquid level for connection of fill piping and monitoring. All openings shall employ fittings constructed in accordance with the Standard UL 142.
 5. Bracing and Support Steel: The bracing and support steel should be used to form the tank. C-channel or I-beam may be employed as bracing or support. The minimum web thickness for I beam or minimum thickness for C-channel shall be 1/4 inch. The spacing between supports channel shall be no more than 25 inches.
 6. Material and Thickness: The steel shall comply with the specifications set forth in the Standard. The minimum thickness of the steel for the top, bottom and the four sides is 7 gauge.
 7. All vents shall be terminated to exterior of enclosure at roofline.
 8. Float switches shall be wired to a terminal box for connection under another contract.
 9. Tank construction shall be a minimum of 7 gauge hot rolled steel.
 10. Secondary containment rupture basin with leak detection as required by Code.
 11. 2 ft. NPT top-mounted fill connection with provisions for extension to a remote location.
 12. Two (2) 2 in. NPT supply connections with a dip pipe, including all necessary piping to the engine fuel filter.
 13. Two (2) 2 in. NPT engine return connections.
 14. 2 in. NPT bottom drain connection.
 15. Level switch with Hi (90%), Lo (75%) and Rupture basin switches.
 16. Indicating level gauge.
 17. All controls shall be wired to a terminal box for use in generator enclosure.
- B. Tests to be Conducted by Manufacturer**
1. Each tank, before painting, shall be tested by the manufacturer and provide tight against leakage in accordance with the following test procedure:
 - a. After completion of the tank, it shall be checked for leakage by applying internal air pressure and using soap suds, linseed oil or equivalent material for detection of leaks. The test pressure shall not be less than 3 psig nor more than 5 psig.
 - b. Upon completion of the finished tank, the primary tank shall again be pressurized to 3 or 5 psig and held for 1 hour to check for leakage. A continuous drop in pressure shall be considered evidence of leakage.
 - c. While maintaining 3 to 5 psig on the primary tank, the space bounded by the primary and secondary tank shall be pressurized to 3 to 5 psig. The secondary tank shall be checked for leakage in accordance with UL Standard 142 by applying a leak detection solution.
 2. If leaks are noted during testing, the tank shall be made tight by welding and retested. Defects in welds shall be repaired as detailed in the Standard, by chipping or melting out from one or both sides of the joint, as required, and rewelding.

2.09 LOCAL INDICATOR CONTROL PANEL (LICP)

- A. A local indicator and control panel (LICP) mounted on the generator shall be provided at the diesel engine-generator set, suitably isolated from vibration, and shall be provided with an isolated control section and a power circuit breaker section. The LICP shall contain all necessary equipment required for isolation, control and annunciation of the unit, including, but not limited to, the following:
1. All alarms, indications, shutdowns, etc., required by NFPA 110 for emergency power supply.
 2. Elapsed time indicator (up to 99,999.9 hours, nonresettable), to indicate time which the diesel engine-generator has run, whether or not it has been on-line.
 3. Jacket water temperature indicator.
 4. Lube oil pressure indicator.
 5. Lube oil temperature indicator.
 6. Fuel oil pressure indicator.
 7. Digital true rms voltmeter capable of simultaneous readings of all phases either line-to-line or line-to-neutral (1% full scale accuracy).
 8. Digital true rms ammeter capable of simultaneous readings of all phases (1% full scale accuracy).
 9. Digital true rms frequency meter, dial type, with 1% accuracy.
 10. Digital kW meter.
 11. Digital “% loaded” meter.
 12. Engine local control switch with “automatic-run-stop” positions.
 13. Circuit breaker open/close switches for the load and load bank overcurrent devices.
 14. Engine prealarm/shutdown annunciator panel with audible alarm and silence switch.
 15. Mushroom type “lockout” switch.
 16. The following safeties shall be provided and annunciated in the LICP:
 - a. Immediate Shutdown
 - 1) High lube oil temperature.
 - 2) Low lube oil pressure.

- 3) High jacket water temperature.
- 4) Overspeed.
- 5) Overcrank.
- b. Prealarms
 - 1) Low oil pressure.
 - 2) High water temperature.
 - 3) Impending engine overload.
 - 4) Low water temperature.
- c. Diesel Engine-Generator Set Alarms
 - 1) Low battery voltage.
 - 2) High battery voltage.
 - 3) Battery charger malfunction.
 - 4) Low water temperature.
 - 5) Low water level.
 - 6) Low lube oil level.
 - 7) Engine crank failure.
 - 8) Controls not in "auto".
 - 9) Reverse power (open output disconnect device).
 - 10) Overcurrent (open output disconnect device).

B. The following safeties shall be terminated on terminal blocks in the control panel:

1. Engine-Generator Set Alarms
 - a. Low oil pressure.
 - b. High water temperature.
 - c. Low water temperature.
 - d. Low water level.
 - e. High oil temperature.

- f. High lube oil level.
 - g. Low lube oil level.
 - h. Water in fuel.
 - i. Battery charger malfunction.
2. Shutdown After Cool-Down
- a. Overcurrent.
 - b. Reverse VAR (Device 40).
3. Immediate Shutdown
- a. High lube oil temperature.
 - b. Low lube oil pressure.
 - c. High jacket water temperature.
 - d. Overspeed.
 - e. Overcrank.
 - f. Reverse power.
 - g. Low water level.
 - h. Engine lockout.
 - i. Emergency stop.
 - j. Control voltage failure.

2.10 DISTRIBUTION OVERCURRENT PROTECTIVE DEVICES

- A. Output overcurrent circuit breaker devices as required for output, fire pumps, fire alarm, load bank, etc., and the local control panel shall be enclosed in NEMA 12 enclosures for the diesel engine-generator set. All devices shall be in separate enclosures. Provide one load bank overcurrent circuit breaker device suitable for use in LICP panel. These devices shall have a minimum of four (4) Form "C" contacts, in the breaker cubicles, wired to terminal blocks for remote monitor status.
- B. The line-side of the circuit breakers shall be bused to a common input bus, which shall be constructed of copper with either silver or tin plating at all joints. Bolted joints shall consist of silver or tin plated copper splice plates and high tensile strength steel bolts, with nuts and Belleville washers tightened to the proper torque. Bus bars and the enclosure shall be sized to

meet the requirements of UL 891 and shall be braced to withstand resulting mechanical forces exerted during short circuit currents, but no less than 100,000 amperes rms symmetrical.

- C. Load bank and distribution circuit breakers shall be insulated case type, electrically and manually operated, 100% rated for continuous duty. Generator output circuit breakers shall be insulated case with a minimum interrupting rating of the available short circuit current from the engine-generator.
- D. Each circuit breaker shall be equipped with a 24 volt DC operating mechanism (with a DC to DC converter) for trip and 120 volt AC (via system UPS provided under this Section) operating mechanism for remote closing and charge.
- E. Provide solid state tripping devices for each distribution circuit breaker, each having a complete range of tripping functions and characteristics built into its solid state module. Module shall be true RMS sensing. Complete system coordination shall be provided by inclusion of following time/current curve shaping adjustments:
 - 1. Ampere setting.
 - 2. Long-time pickup.
 - 3. Long-time delay.
 - 4. Short-time pickup.
 - 5. Short-time delay.
 - 6. Instantaneous pickup.
 - 7. Ground fault.
- F. Visual indicators shall be provided to indicate tripping mode, i.e., overload, short circuit, ground fault. All circuit breakers shall be equipped with test points for in-service function testing. Provide one test kit for testing of all frame sizes.
- G. Furnish and install a ground detection system for each distribution overcurrent device. The ground detection system shall be the type that monitors the outgoing ground fault current and shall consist of a ground sensor, which surrounds all three or four outgoing conductors, and a relay to operate an alarm indication on the face of the breaker with remote contacts for monitoring. The ground sensor shall have adjustable current pickup settings and adjustable time settings.
- H. Furnish and install an electrical interlock system between the engine-generator load bank circuit breaker and its respective engine output circuit breaker to prohibit simultaneous closure of more than one device with the command to close provided at the LICP.
- I. Changes in settings shall be made by adjustment at the circuit breaker trip module or by interchangeable switching plugs for precise settings. All settings shall be sealable. Manufacturer shall submit recommended settings for all protective devices to achieve a completely selective coordinated system from the main protective device provided in this

arrangement through and including the circuit overcurrent device and each ATS. Provide a complete coordination study indicating device settings and ratings for the entire power system.

- J. In addition to metering hereinafter described in the generator control section of the Specification, provide, at each distribution device, three current transformers of suitable ratio and 1% accuracy switchboard type digital ammeter, similar to Electro Industries 3DAA5, or approved equal.
- K. Adequate conduit space shall be provided in the rear compartment of the compartments to satisfy the current ratings of the individual devices and the input from the generator. All cable terminations shall be made with two bolt hole concentric compression type copper bodied long barrel lugs which shall be identical to the lugs provided in the emergency switchboard.
- L. Provide a separate portable circuit breaker lifting device to be used for access to all circuit breakers in the LICP.

2.11 REMOTE ANNUNCIATION

- A. In addition to indications previously specified in this Section, provide one set of Form "C" contacts rated 125 volt, 10 ampere wired to rear compartment labeled terminal strips in their respective enclosures for extension and remote annunciation:
 - 1. Automatic transfer switch (ATS) status (provide six [6] points for each ATS: connected to normal, connected to emergency, normal source available, emergency source available plus two spare).
 - 2. Ground fault alarm for each generator service distribution device.
 - 3. Diesel engine-generator status (provide generator available, generator running, generator stop).
 - 4. Open/closed indication for each generator output overcurrent protective device.
 - 5. Engine-generator summary failure alarm.
- B. Provide a remote annunciator, located in the Building Engineer's Office.

2.12 LOAD BANK

- A. Provided as part of the generator package is a 100 kW, 1.0 power factor continuous rated load bank for diesel engine-generator system testing. Load bank shall be a completely self-contained unit and shall include all resistive load elements, load control devices, and protective devices. Each unit shall be constructed of structural steel channel and angle iron with steel panels, shall be mounted on the discharge side of the diesel engine-generator radiator.
- B. The load bank shall contain resistive load units in incremental sizes to allow for step loading. Rating shall be 480 volt, 3 phase, 3 wire.
 - 1. Load steps shall be as follows:

- a. 1 - 5 kW
 - b. 2 - 10 kW
 - c. 3- 25 kW
- C. The load bank shall be operated and monitored by an integrated automatic control panel in a separate NEMA 12 enclosure, to be mounted in the generator enclosure, and shall include the following items:
- 2 - 3-1/2 inch AC voltmeter, with $\pm 2\%$ full scale accuracy.
 - 2 - 3-1/2 inch AC ammeter with $\pm 2\%$ full scale accuracy and three current transformer.
 - 2 - Ammeter 3 phase selector switch.
 - 2 - Voltmeter 3 phase selector switch.
 - 2 - 3-1/2 inch kilowatt meter.
 - 2 - Resistive load step control switches with indicating light for each load step of each load bank.
 - 1 - Load bank status indicator (i.e., common failure indication per load).
- D. The load bank shall be fed from an additional generator output circuit breaker.
- E. The load bank shall not be utilized for any portion of the full load required for both factory and site acceptance testing.
- F. The controls of the load bank shall be interlocked with the emergency power control system to prevent the load bank from being energized in the event of an actual loss of power, as sensed at the automatic transfer switches (ATS's). This interlock shall not prevent the load banks from being used in conjunction with actual building loads for testing of the emergency power system. Wiring in separate "control" conduit shall be run to each ATS to actuate load bank dump upon actual normal power failure at any ATS.
- G. All conductors and terminals shall be copper with tin or silver plating at bus joints. All lugs shall be copper bodied, two bolt hole concentric compression, long barrel type.
- 2.13 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY AND ARC-FLASH STUDY
- A. Coordinate with service switchboard manufacturer providing the overcurrent protective device coordination study and arc-flash study and provide all necessary information, pertaining to the emergency power system, required to complete the overcurrent protective device coordination study and arc-flash study as outlined in specification section 26 05 73.

2.14 INSTALLATION SUPPORT

- A. Delivery of the generator shall be coordinated with the installing contractor. All storage and delivery fees shall be part of this contract document.
- B. Installation of the emergency power system shall be in full accordance and under the technical supervision of qualified technicians provided by the manufacturer. The initial meeting shall take place within two weeks of the Contract award and shall be attended by both the factory project engineer and Filed Service Technicians. As a minimum, the agenda shall include a technical review of the Specification, exceptions taken, a review of the submissions required, system operation and acceptance test procedures. Subsequent meetings are intended to provide instruction to the installing Contractor as to the proper handling, installation and wiring of the vendor's equipment, as well as a review of the Contractor's questions and installation methods during the installation of the equipment.
- C. The manufacturer shall furnish a minimum of fifteen (15) working days of technical supervision, on-site, for the purpose of overseeing the installation and to conduct and assist the Owner with the site acceptance test. Participation by the manufacturer shall include providing a final check of all wiring, terminations, connections, and startup, interpretation and analysis of site acceptance test results, adjustments if required of controls, etc., all to the satisfaction of the Owner.
- D. The DEG manufacturer shall furnish a minimum of ten (10) working days of technical supervision, on-site, for the purpose of assisting the Owner with commissioning critical systems and the integration of the EPS with these systems. The man-hours provided in this paragraph are in addition to any other requirements previously specified.

2.15 FACTORY ACCEPTANCE TESTING

- A. The diesel engine-generator set shall be tested at the factory to demonstrate compliance with the Specifications. Tests may be witnessed by the Owner and/or his representative. (Submit a detailed chronological test plan with the shop drawings.) A certified copy of this performance test shall be submitted before shipment to the job site, with a minimum of the following conditions tested.
 - 1. The engine-generator set shall be capable of attaining rated voltage and frequency under no-load conditions, within ten (10) seconds of the initiation of a start signal.
 - 2. The engine-generator set shall be operated under continuous rated load conditions for a minimum of six (6) hours. The generator set shall maintain rated voltage ± 5 volts and rated frequency ± 0.5 hertz for the duration of the full load test. Voltage, amperage and frequency measurements, as well as engine gauge and monitor points, shall be recorded at 15 minute intervals.
 - 3. From a "cold" start, operate the unit from 0 to 100 percent load, starting at no load and increasing in increments of 25 percent then decreasing from 100 to 0 percent load in 25 percent increments. Hold at each incremental load for 10 minutes and check at each load point for stable operation, fuel consumption, engine performance, and generator performance. The generator shall be capable of returning to its rated voltage and frequency as follows:

Load Step	Maximum Voltage Dip	Maximum Frequency Dip	Maximum Recovery Time
100%	25%	16%	7 seconds
75%	15%	10%	3 seconds
50%	7%	5%	2 seconds

4. Operate the unit from 0 to 100 percent load, with the following increments: 0% to 50%, 50% to 0%, 25% to 75%, 75% to 25%, 0% to 100%, 100% to 0%. Hold at each incremental load for 10 minutes and check for stable operation. The generator set shall be capable of returning to its rated voltage and frequency with a maximum voltage drop as described hereinabove when incremental loads are added. Record voltage and frequency transients.
 5. Perform full load transient tests verifying that kilowatts, voltage, amperes, and frequency transient characteristics are within acceptable limits. Submit oscillograph tracings with all 3 phases of voltage and frequency recorded for all transient tests.
 6. Acoustical readings, taken on all sides, top and bottom, shall verify acoustical performance.
- B. The overcurrent protective devices and control systems shall be factory tested to demonstrate their ability to provide all functions hereinbefore specified, including the verification of all system safeties, protection circuits and system operation. The automatic transfer switches and switchboards may be tested separately from the diesel engine-generator sets. Test may be witnessed by the Owner and/or his representative(s).
1. Exercise each circuit breaker.
 2. Demonstrate the operation of all logic and protective circuits using simulated engine-generator operations.

2.16 SITE ACCEPTANCE TEST

- A. The complete generator system shall be tested as hereinafter described under the supervision of a capable service engineers provided by the diesel engine-generator manufacturer and the control system manufacturer. (Submit a detailed chronological test plan with the shop drawings.) Prior to any testing, verify that the plant is complete and ready for testing and that all instrumentation required is connected and ready for startup and test. Tests shall be witnessed by the Owner and/or his representatives. Provide necessary lube oil, fuel oil, as well as testing and recording equipment to obtain full load conditions, including the required temporary load banks, full load and temporary cable connections to generator output switchboard. Testing shall be repeated at no additional cost to the Owner if required for total components and system acceptance.
- B. The on-site test program shall cover the following as a minimum:
1. Verify that all components are correctly installed and interconnected. Exercise each circuit breaker and its drawout mechanism and each automatic transfer switch.

2. Test the engine protective device and verify the accuracy of instrumentation set points. Provide coordination study for each overcurrent and ground fault device and calibrate same before any tests are performed. Circuit breaker testing shall be provided by a third party Subcontractor using a Primary Injection Method. Coordination study shall be used for all protective device settings.
 3. The diesel engine-generator shall be operated individually under full load conditions for a minimum of six (6) hours. The diesel engine-generator set shall maintain rated voltage ± 5 volts and rated frequency ± 0.5 hertz for the duration of the full load test. Voltage, amperage and frequency measurements, as well as engine gauge and monitor points, shall be recorded at 15 minute intervals. All electrical connections shall be thermoscanned at 1-hour intervals.
 4. From a "cold" start, operate the diesel engine-generator from 0 to 100 percent load, starting at no load and increasing in increments of 25 percent. Hold at each incremental load for 10 minutes and check at each load point for stable operation, fuel consumption, engine performance, and generator performance. The generator shall be capable of returning to its rated voltage and frequency as described hereinabove with a maximum voltage drop when incremental loads are added. Demonstrate kVA, kVA_r and circulating currents are within acceptable limits at each system load step. Report system tests with generator connected to emergency panelboard.
 5. Perform load transient tests verifying that kilowatts, voltage, amperes, and frequency transient characteristics are within acceptable limits. The transient tests provided in the factory shall be repeated during this test, and in addition, transient recordings shall be made to specified load steps as a system. Submit oscillograph tracings of all transient tests.
 6. Operate the entire generator-backed power system under a full load test for a minimum of eight (8) hours. The system shall maintain rated voltage ± 5 volts and rated frequency ± 0.5 hertz for the duration of the full load test. Voltage, amperage, and frequency measurements as well as all individual LICP gauge measurements shall be recorded at 10 minute intervals.
 7. The generator shall be capable of attaining rated voltage and frequency within 10 seconds of the initiation of a start signal.
 8. Operate load shedding and bypass system and components to verify suitable operation of automatic transfer switches, and priority panel.
 9. Submit a detailed chronological test plan with shop drawings.
 10. Acoustical readings, taken on all sides, top and bottom, shall verify acoustical performance.
- C. Perform a final integrated system test ("pull-the-plug") to demonstrate the system as a whole, including safeties, etc., to the satisfaction of the Owner/Engineer. This test shall not be conducted as an extension of the site acceptance test, but rather as a separate test after substantial completion of all other work associated with this project. (Submit a detailed chronological test plan with the shop drawings.)

1. Operate all other features of the control system, including but not limited to: load demand control, main bus overload protection, etc.
 2. This test shall utilize actual building loads and fifteen (15) temporary portable 100 kW load banks (furnished by this Section) to be distributed throughout the facility and temporarily connected to the electrical power distribution system.
- D. Provide complete, chronological, detailed factory, on-site and pull-the-plug test procedures for approval with shop drawings.
- E. A minimum of ten (10) working days notice shall be provided to the Owner, Architect and Engineer, in writing, before all factory, on-site and pull-the-plug testing.

PART 3 - EXECUTION (FOR REFERENCE ONLY)

3.01 INSTALLATION

- A. Generator installation shall be where shown on drawings. Provide all terminals and associated point to point and schematic drawings for wiring, power wiring, remote monitoring wiring and control wiring to systems and ATS's, etc. Provide all rigging, coordination, etc., in accordance with manufacturer's guidelines. Coordinate all installation requirements with the installing contractor.
- B. Delivery of the generator shall be coordinated with the installing contractor. All storage and delivery fees shall be part of this contract document.
- C. Installation of the emergency power system shall be in full accordance and under the technical supervision of qualified technicians provided by the manufacturer. The initial meeting shall take place within two weeks of the Contract award and shall be attended by both the factory project engineer and Filed Service Technicians. As a minimum, the agenda shall include a technical review of the Specification, exceptions taken, a review of the submissions required, system operation and acceptance test procedures. Subsequent meetings are intended to provide instruction to the installing Contractor as to the proper handling, installation and wiring of the vendor's equipment, as well as a review of the Contractor's questions and installation methods during the installation of the equipment.
- D. The manufacturer shall furnish a minimum of fifteen (15) working days of technical supervision, on-site, for the purpose of overseeing the installation and to conduct and assist the Owner with the site acceptance test. Participation by the manufacturer shall include providing a final check of all wiring, terminations, connections, and startup, interpretation and analysis of site acceptance test results, adjustments if required of controls, etc., all to the satisfaction of the Owner.
- E. The DEG manufacturer shall furnish a minimum of ten (10) working days of technical supervision, on-site, for the purpose of assisting the Owner with commissioning critical systems and the integration of the EPS with these systems. The man-hours provided in this paragraph are in addition to any other requirements previously specified.

3.02 SITE ACCEPTANCE TEST

- A. The complete generator system shall be tested as hereinafter described under the supervision of a capable service engineers provided by the diesel engine-generator manufacturer and the control system manufacturer. (Submit a detailed chronological test plan with the shop drawings.) Prior to any testing, verify that the plant is complete and ready for testing and that all instrumentation required is connected and ready for startup and test. Tests shall be witnessed by the Owner and/or his representatives. Provide necessary lube oil, fuel oil, as well as testing and recording equipment to obtain full load conditions, including the required temporary load banks, full load and temporary cable connections to generator output switchboard. Testing shall be repeated at no additional cost to the Owner if required for total components and system acceptance.
- B. The on-site test program shall cover the following as a minimum:
1. Verify that all components are correctly installed and interconnected. Exercise each circuit breaker and its drawout mechanism and each automatic transfer switch.
 2. Test the engine protective device and verify the accuracy of instrumentation set points. Provide coordination study for each overcurrent and ground fault device and calibrate same before any tests are performed. Circuit breaker testing shall be provided by a third party Subcontractor using a Primary Injection Method. Coordination study shall be used for all protective device settings.
 3. The diesel engine-generator shall be operated individually under full load conditions for a minimum of six (6) hours. The diesel engine-generator set shall maintain rated voltage ± 5 volts and rated frequency ± 0.5 hertz for the duration of the full load test. Voltage, amperage and frequency measurements, as well as engine gauge and monitor points, shall be recorded at 15 minute intervals. All electrical connections shall be thermoscanned at 1-hour intervals.
 4. From a "cold" start, operate the diesel engine-generator from 0 to 100 percent load, starting at no load and increasing in increments of 25 percent. Hold at each incremental load for 10 minutes and check at each load point for stable operation, fuel consumption, engine performance, and generator performance. The generator shall be capable of returning to its rated voltage and frequency as described hereinabove with a maximum voltage drop when incremental loads are added. Demonstrate kVA, kVAR and circulating currents are within acceptable limits at each system load step. Report system tests with generator connected to emergency panelboard.
 5. Perform load transient tests verifying that kilowatts, voltage, amperes, and frequency transient characteristics are within acceptable limits. The transient tests provided in the factory shall be repeated during this test, and in addition, transient recordings shall be made to specified load steps as a system. Submit oscillograph tracings of all transient tests.
 6. Operate the entire generator-backed power system under a full load test for a minimum of eight (8) hours. The system shall maintain rated voltage ± 5 volts and rated frequency ± 0.5 hertz for the duration of the full load test. Voltage, amperage, and frequency measurements as well as all individual LICP gauge measurements shall be recorded at 10 minute intervals.

7. The generator shall be capable of attaining rated voltage and frequency within 10 seconds of the initiation of a start signal.
 8. Operate load shedding and bypass system and components to verify suitable operation of automatic transfer switches, and priority panel.
 9. Submit a detailed chronological test plan with shop drawings.
 10. Acoustical readings, taken on all sides, top and bottom, shall verify acoustical performance.
- C. Provide all labor and materials required for on-site testing with dummy load at unity power factor, including but not limited to, the following:
1. The required resistive dummy load banks to achieve system full load conditions.
 2. Temporary connections, copper cable, from generator output switchboards to dummy load, including grounding conductor.
 3. Overcurrent and short circuit protection devices, contactors, relays, etc., for temporary cables, as required.
 4. All instrumentation and connections required to measure and record test data (switchboard mounted instruments are not acceptable). Provide accurate voltage, current, frequency, and kW meters to accomplish this. For each transient or load change, provide oscillograph trace recordings of voltage frequency and current, showing the initiating disturbances, entire restabilization period for each. Record and log all test data and submit to Owner in a comprehensive test report. Provide ten (10) copies.
 5. Disconnection and removal of all temporary power and control wiring and equipment. (Deinstallation under other Section.)
 6. Ten (10) sets of certified test reports, submitted within two (2) weeks.
- D. Perform a final integrated system test ("pull-the-plug") to demonstrate the system as a whole, including safeties, etc., to the satisfaction of the Owner/Engineer. This test shall not be conducted as an extension of the site acceptance test, but rather as a separate test after substantial completion of all other work associated with this project. (Submit a detailed chronological test plan with the shop drawings.)
1. Operate all other features of the control system, including but not limited to: load demand control, main bus overload protection, etc.
 2. This test shall utilize actual building loads and fifteen (15) temporary portable 100 kW load banks (furnished by this Section) to be distributed throughout the facility and temporarily connected to the electrical power distribution system.
- E. Provide complete, chronological, detailed factory, on-site and pull-the-plug test procedures for approval with shop drawings.

- F. A minimum of ten (10) working days notice shall be provided to the Owner, Architect and Engineer, in writing, before all factory, on-site and pull-the-plug testing.

END OF SECTION

APPENDIX "A"

TECHNICAL DATA BID ANALYSIS FORM

1. Data submitted by:

Company: _____

Signed by: _____

Title: _____

Date: _____

2. Diesel Engine-Generator

Unit rated output, standby duty _____ kW

Weight of complete set, including cooling water, lube oil, generator output breaker, batteries and accessories _____ lbs.

Overall dimensions HxWxD _____ inches

Overall dimensions with suggested clearances HxWxD _____ inches

3. Speed Control System

Manufacturer _____

Type/Model _____

Overspeed set point _____ rpm

4. Generator

Manufacturer _____

Type/Model _____

Output, continuous duty _____ kW

Overload capability, percent _____

Hours per year _____

Speed _____ rpm

Kva at 480 volt, 60 Hz. _____

Power factor _____

Armature current _____ amps

Short circuit contribution 1 phase _____ symmetrical amps

3 phase _____ symmetrical amps

5. Diesel Engine

Manufacturer _____

Type/Model _____

Break horsepower, standby _____

Speed _____ rpm

Cylinder _____

Displacement _____ cu.in.

Cycles _____

BMEP _____ psi

Combustion airflow _____ cfm

Maximum allowable pressure drop,
air intake system _____ in. H₂O

Maximum pressure drop across muffler _____ in. H₂O

Available backpressure after silencer _____ in. H₂O

Exhaust flow _____ cfm

Maximum exhaust temperature _____ °F

Maximum allowable exhaust back pressure
water gauge _____ inches

Total heat rejection to room _____ Btu/Hr.

Maximum operating ambient temperature _____ °F

Exhaust line size _____ inches

6. Engine Starting System

Battery, Manufacturer _____

Model Number/Type _____
 Number of cells per string _____
 Ampere hr capacity _____
 Expected Life _____ years
 Charger, Manufacturer _____
 Model/Type _____
 Rating _____ amps
 Input voltage/full load current _____ V/amps

7. Engine Fuel System
 Type of fuel oil _____
 Engine fuel consumption at rated load and speed _____ gpm
 Total fuel oil flow required at rated load and speed _____ gpm

8. Engine Lubrication System
 Lube oil SAE rating and type _____
 System pressure _____ psig
 Oil fill capacity _____ gal.
 Lube consumption _____ qt./hr.
 Oil filter type _____

9. Engine Cooling Water System
 Cooling water capacity _____ gal.
 Cooling water temperature _____ °F max./min.
 System pressure _____ psig
 Radiator, overall dimensions HxWxD _____ inches
 Required airflow, at 120°F _____ min. cfm
 _____ max. cfm

Electric water heating rating _____ kW/volt/phase

10. Excitation System

Exciter, Manufacturer _____

Type/Model _____

Voltage Regulator, Manufacturer _____

Type/Model _____

Regulation, full load _____

3/4 load _____

1/2 load _____

1/4 load _____

11. Load Bank

Continuous rating _____ kW

Voltage/phase _____ V/phase

Power factor _____

Electrical input required for forced air fan including 120V control and heating elements _____ V/phase/kW

Overall dimension HxWxD _____ inches

Overall dimension with suggested clearances HxWxD _____ inches

Quantity of remote control panels _____

12. Acoustical Data

Engine noise at 5 ft. 0 in. (running) _____ dBA

Noise at 5 ft. 0 in. from attenuated muffler discharge _____ dBA

Octave Band Performance: 1 _____ dB

2 _____ dB

3 _____ dB

4 _____ dB

5 _____ dB

6 _____ dB

7 _____ dB

13. Engine-Generator Protection System

List any additional alarm, shutdown and trip devices considered necessary for safe operation and protection of the generator and excitation system, which the bidder proposes to furnish.

14. Installed Base

Provide a list of installed and functioning systems located in the U.S. that are similar to the proposed system. The list should include the name of the project, location, type of system, start-up date, name and phone number of contact.

15. Service

A. Service: Location of the nearest factory owned service facility with respect to the project under consideration.

B. Guaranteed Response Time: Number of hours required to have manufacturer's service personnel at the site after notification of an emergency condition - Guaranteed.

C. Service Personnel: Number of full-time service personnel at the location provided in 15.A. Do not include employees who are not on 24 hour call.

D. **Local Service:** Name and location of the nearest contracted service company, guaranteed response time, and number of factory trained service personnel.

16. **Experience**

A. **Age of Product:** Number of years the proposed product has been manufactured by the manufacturer.

B. **Tenure of Manufacturer:** Number of years the manufacturer has been engaged in the manufacture of the proposed product.

APPENDIX "B"

RATING WORKSHEET

1. Published hp at flywheel without fan at 120°F (ambient temperature) _____ hp
2. Hp loss at radiator fan _____ hp
3. Net hp at 120°F ambient (1) - (2) = _____ hp
4. Net mechanical kW at flywheel (3) x 0.746 = _____ kW
5. Generator efficiency at 200 kW, 480 volt = _____ kW
6. Net kW (4) - (5) = _____ kW

Submit cuts, graphs and charts from radiator and generator manufacturer with the relevant information highlighted.

SECTION 263623 - AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.01 SUMMARY

A. Furnish all automatic transfer switches. Include all lugs, connectors and terminations required, but not specifically indicated, on the generator, switchboard and automatic transfer switch Shop Drawings.

B. Section includes:

1. Bypass and Isolating Automatic Transfer Switches.
2. Control Panel.

1.02 RELATED SECTIONS

A. The following specification sections apply to all Work herein:

1. Section 26 05 03 - Electrical Pre-Purchase General.
2. Section 26 32 13.13 - Diesel-Engine-Driven Generator Set.
3. Section 26 05 73 - Overcurrent Protective Device Coordination Study and Arc Flash Study.

1.03 REFERENCES

A. All automatic transfer switches and all components shall be designed, manufactured, and tested in accordance with the latest applicable codes and reference standards, including the following:

B. Codes:

1. BCSNJ - Building Code of the State of New Jersey.
2. NJSEC - New Jersey State Electrical Code.

C. Reference Standards:

1. UL1008 - Standards for Automatic Transfer Switches.
2. NFPA 101 - Life Safety Code.
3. NFPA 110 - Standard for Emergency and Standby Power Systems.

1.04 SUBMITTALS

A. The following submittal data shall be furnished according to the Conditions of the Construction Contract, General Conditions and Section 26 05 00 and shall include, but not be limited to:

1. Automatic Transfer Switch, including complete system descriptive data of all mechanical and electrical components, interface with generator, switchboard and remote monitoring system, operational characteristics, etc. Complete details shall be provided consisting of dimensional drawings, and wiring diagrams.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with the General Requirements and Section 26 05 03

1.06 WARRANTY

- A. Comply with the requirements of the Division 01 and Section 22 05 03.
- B. The manufacturer shall warranty his equipment to meet the performance conditions specified for the period of time which is normal industry practice for this type of equipment, but in no case for less than two (2) years from the date of Owner's final system acceptance. If the base price includes a warranty period of a longer duration, state this period in the base price.
- C. During the period of the warranty, equipment which discloses defects in design, material or workmanship shall be replaced, including all parts and labor for all auxiliary equipment and materials, by the manufacturer at no cost to the Owner.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Being listed herein as an acceptable manufacturer does not permit the manufacturer to provide standard manufactured equipment which does not comply with the performance and/or physical characteristic requirements of the Contract Documents.
- B. If it complies with the Contract Documents, automatic transfer switches manufactured by one of the following manufacturers will be acceptable:
 1. ASCO/Emerson.
 2. Russelectric Inc.
 3. Or approved equal.

2.02 GENERAL

- A. Automatic transfer switches and manual transfer switches shall be provided and rated as shown on the contract documents. Each transfer switch shall be capable of switching all classes of load and shall be rated for continuous duty when installed in a nonventilated enclosure constructed in accordance with Underwriters Laboratories, Inc. Standard UL-1008.
- B. The transfer switch shall be rated to close on and withstand the available RMS symmetrical short circuit current of 100,000 amperes unless otherwise scheduled on the contract documents.

The switch mechanism shall be listed to the UL 1008 standard for 1.5 and 3 cycle ratings. Series rating with upstream protective devices will not be accepted.

C. The transfer switch shall include a three-position momentary test keyswitch which shall be provided for test/automatic/reset modes. The test switch will simulate a normal source failure. The reset switch shall bypass the time delays on either transfer to emergency or transfer to normal. The transfer switch shall also include a keyswitch to enable or disable automatic return to normal (after a 0-300 second time delay factory set at "0" seconds), pilot lights on the cabinet door to indicate the position of the switch (red — emergency, green — normal, white — neutral, where provided), pilot lights on the cabinet door to indicate source availability (red - emergency available, green - normal available). Emergency pilot lights shall be push-to-test type, and four additional auxiliary contacts on the main shaft, two closed on normal and two closed on emergency, unless a greater quantity is called for in schedules or required to meet specified operations. Each transfer switch shall include an event counter, which shall count the quantity of operations. The following alarms shall also be annunciated via Form "C" contacts for connection to BMS system.

1. Normal source available.
2. Emergency source available.
3. Connected to normal.
4. Connected to emergency.

D. The transfer switch, complete with timers, relays and accessories, shall be listed by Underwriters Laboratories, Inc., in their Electrical Construction Materials Catalogue under Standard UL-1008 (automatic transfer switches) and approved for use on emergency systems outlined in NFPA 110.

E. Each switch shall have two positions (normal, emergency) or three positions (normal, neutral, emergency) and shall be double-throw. The switch shall be electrically operated and mechanically held, with the operating mechanism energized only during time of transfer. All main contacts shall be silver alloy, wiping action type, protected by separate arcing contacts and blowout coils. Contacts shall be of a design specifically intended for automatic transfer switch service, and shall not be circuit breaker contact assemblies.

F. All switch and relay contacts, coils, springs and control elements shall be removable from the front of the transfer switch without removal of the switch panels from the enclosure and without disconnection of drive linkages or power conductors. Sensing and control relays shall be continuous duty industrial control type with minimum contact rating of 10 amperes. All timers shall be field adjustable without de-energizing control circuits.

2.03 RATINGS

A. Switches serving 3 phase, 4 wire loads shall be provided with overlapping neutral transfer contacts which shall be "overlapped" only during transfer operation and remain so "overlapped" until the main contacts close to the source being transferred to. Overlap time shall not exceed 100 ms. 4-pole switches may be substituted for overlapping neutral.

- B. Switches serving large motor loads shall be provided with "in-phase" monitors or neutral position with time delay to prevent excessive currents during transfer of these loads.
- C. All control relays, solid-state voltage monitors, transfer switch assemblies, shall be the product of a single manufacturer regularly engaged in design, development and production of automatic transfer switches. Said manufacturer shall provide service and spare parts 24 hours-a-day, 7 days-a-week, which shall be available at a local level.
- D. Adequate conduit space shall be provided in each automatic transfer switch to satisfy the cabling design. All cable terminations shall be made with two-bolt hole, long, barrel, copper bodied, concentric compression type lugs, which shall be supplied with the automatic transfer switch. Automatic transfer switches shall be enlarged to accommodate lugs at no additional cost, if required.
- E. A full duplex RS485 redundant supervised interface shall be installed in each ATS to enable serial communication. The serial communications shall be capable of a direct connect or a multi-drop configured network. This shall allow for the seamless integration of existing and/or new communication to transfer switches.

2.04 CONTROL PANEL

- A. Each automatic transfer switch shall be equipped with a microprocessor based control panel. The control panel shall perform the operational and display functions of the transfer switch.
- B. The digital display shall be accessible without opening the enclosure door and shall be provided with a 4 line by 20 character LCD display screen with touch pad function and display menus. The programming functions shall be pass code protected.
- C. The control panel shall be provided with menu-driven display screens for transfer switch monitoring, control and field-changeable functions and settings.
- D. The control panel shall be optoisolated from electrical noise and provided with the following inherent control functions and capabilities:
 - 1. Multipurpose display for continuous monitoring and control of the ATS functions and settings. All field-changeable functions shall be pass code protected and accessible through the keypad.
 - 2. Built-in diagnostic display that includes the capturing of historical data, such as number of transfers and time on alternate power source, for ease of troubleshooting.
 - 3. Voltage monitors shall be provided to sense all ungrounded lines of the normal source voltage and initiate an emergency sequence of operation upon loss of or reduction in any line of the normal source to 85 percent or less for an adjustable period of 0.5 to 6 seconds. Upon return of the normal source to 95 percent or more on all lines, the voltage monitors shall initiate a retransfer to normal. The voltage monitors shall be solid-state and field adjustable on pickup from 85 percent to 100 percent of nominal and on dropout from 75 percent to 98 percent of pickup. Monitors shall have a minimum repetitive accuracy of 2 percent of the set point over a temperature range of -20°C to 75°C.

4. A time delay shall be included to allow stabilization of the normal source at acceptable limits before retransfer of the load from the emergency source. The time shall be adjustable in one minute increments, from 0 to 30 minutes maximum.
 5. Control circuitry shall provide for the retransfer to a dead normal source or neutral position for load shedding upon loss of sufficient generating capacity and bypass to the alternate source under test condition. The controls shall include necessary auxiliary contacts to give indication of transfer switch position and source availability. The controls shall also include a pilot contact, to close and initiate the start of the diesel engine-generator system and open to stop the system. In addition, these controls shall include a voltage sensing relay to sense the availability of emergency power prior to allowing transfer, to insure its acceptability.
- E. Provide electrical submetering for the load side of each ATS with power metering display as follows. Coordinate all CT's and connections.
1. Current, per phase and neutral.
 2. Current unbalance.
 3. Voltage, phase-to-phase and phase-to-neutral.
 4. Voltage unbalance.
 5. Real power, per phase and 3-phase total.
 6. Reactive power, per phase and 3-phase total.
 7. Apparent power, per phase and 3-phase total.
 8. Power factor, 3-phase total and per phase.
 9. Frequency.

2.05 INSTALLATION SUPPORT

- A. Installation of the automatic transfer system shall be in full accordance and under the technical supervision of qualified technicians provided by the manufacturers as part of this Contract. The Contractor shall meet with Field Service Technicians to review installation instructions, handling and wiring of the equipment.
- B. The automatic transfer switch system shall be installed in accordance with the equipment manufacturer's written instructions and recommendations to ensure that the system complies with the Specifications and serves the intended purpose.

2.06 FACTORY TESTING

- A. All standard factory tests on all ATS's shall be performed at the same time, in accordance with the latest version of NEMA and UL Standards. Advise the Owner four (4) weeks prior to the scheduled factory test in order to allow Owner to attend and witness the test.
- B. The manufacturer shall provide three (3) certified copies of factory test reports as part of the required submittals.

2.07 FIELD TESTING

- A. The manufacturer shall provide technical support and field personnel to assist the contractor in field testing. The manufacturer shall provide a minimum of (10) working days of field support for field testing.
- B. On-site acceptance shall verify that all components are currently installed and interconnected. Exercise each automatic transfer switch, including its drawout mechanism (where provided).
- C. Test each ATS on its backup source, individually, and with all ATS's and backup sources collectively.
- D. Test all ATS's and all backup sources at the completion of the project by conducting a full-scale pull-the-plug test in the building.

PART 3 - EXECUTION (FOR REFERENCE ONLY)

3.01 INSTALLATION

- A. Installation of the automatic transfer system shall be in full accordance and under the technical supervision of qualified technicians provided by the manufacturers as part of this Contract. The Contractor shall meet with Field Service Technicians to review installation instructions, handling and wiring of the equipment.
- B. The automatic transfer switch system shall be installed in accordance with the equipment manufacturer's written instructions and recommendations to ensure that the system complies with the Specifications and serves the intended purpose.

3.02 CONTROL WIRING

- A. In addition to the control wiring indicated above and by the vendor, provide the following control wiring:
 - 1. 4 #12-3/4 in. C. – two (2) from engine start contact on transfer switch to respective emergency generator control panel.
 - 2. 4 #12-3/4 in. C. – two (2) from engine start contact on transfer switch to respective Fire Alarm Control Panel.

3. Wiring in conduit as required (per the manufacturer) from transfer switch to all remote annunciator panels, and engine control panels for transfer switch control/annunciation.

3.03 FIELD TESTING

- A. On-site acceptance shall verify that all components are currently installed and interconnected. Exercise each automatic transfer switch, including its drawout mechanism (where provided).
- B. Test each ATS on its backup source, individually, and with all ATS's and backup sources collectively.
- C. Test all ATS's and all backup sources at the completion of the project by conducting a full-scale pull-the-plug test in the building.

END OF SECTION

APPENDIX "A"

TECHNICAL DATA BID ANALYSIS FORM

1. Data submitted by:

Company: _____

Signed by: _____

Title: _____

Date: _____

2. Automatic Transfer Switch (Provide a separate report for each size and type)

Type and Amperes _____

Overall dimensions HxWxD _____ inches

Overall dimensions,
with suggested clearances HxWxD _____ inches

Installed weight _____ lbs.
_____ lbs.

Shipping size HxWxD _____ inches

Shipping weight _____ lbs.

Lifting eyes provided? _____

3. Bypass Isolation Type Automatic Transfer Switch

(Provide a separate report for each size and type)

Type and Amperes _____

Overall dimensions HxWxD _____ inches

Overall dimensions,
with suggested clearances HxWxD _____ inches

Installed weight _____ lbs.

Shipping size HxWxD _____ inches

Shipping weight _____ lbs.

Lifting eyes provided? _____

Project no. P1107-00
 Project name: CRRNJ
 EQUIPMENT PRE-PURCHASE

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

STV Architects, Inc.
 420 West 27th Street, Suite 200
 New York, NY 10001

STV INC.
 225 Park Avenue South
 New York, NY 10003-8237

BAHNS, Inc.
 379 Princeton - Hightstown Road
 Cranbury, New Jersey 08512

JARLONSKI BUILDING CONSERVATION, INC.
 40 West 27th Street, Suite 1201
 New York, NY 10001

USA Environmental Management, Inc.
 344 West State Street
 Trenton, New Jersey 08618

VerDamen & Associates
 6 Regent Street, Suite 204
 Livingston, New Jersey 07039

VJA Associates of New Jersey, Inc.
 1180 King George Road, Suite 306
 Edison, New Jersey 08837

Project Manager: E. K. ASFOUR
 Design Manager: D. K. TURNER
 Project Architect/Engineer: L. E. PANUELA
 Designer: JOEL ANDREU
 Drawn by: STEPHEN DELUCA
 Checked by: FRED TAMAYO, P.E.
 Dept. Head: D. M. ZISKIND

Date: August 15, 2014

Project: Central Railroad of New Jersey (CRRNJ)
 Address: Terminal Building
 1000 King George Road
 Edison, New Jersey

Electrical
 ONE LINE DIAGRAM

SK-02

Number: N.T.B.
 Sheet to Complete: 2

