



“Protecting Public Health and the Environment”

CONTRACT No. A992

PASSAIC VALLEY SEWERAGE COMMISSION
600 WILSON AVENUE
NEWARK, NEW JERSEY 07105

CONTRACT AND SPECIFICATIONS

FOR

**WASTE ACTIVATED SLUDGE PUMPING STATION
EXPANSION PROJECT**

NJEIT Project No. S340689-34

MARCH 2016



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**WASTE ACTIVATED SLUDGE PUMPING STATION
EXPANSION PROJECT**

NJEIT Project No. S340689-34

MARCH 2016

Date: _____

JOHN N. ROGERS, P.E.

N.J. Professional Engineer - Lic. No. GE 3682700

PASSAIC VALLEY SEWERAGE COMMISSION
NEWARK, NEW JERSEY

WASTE ACTIVATED SLUDGE PUMPING STATION REPLACEMENT PROJECT

CONTRACT NO. A992
Table of Contents

<u>SECTION</u>	<u>PAGES</u>
<u>DIVISION 00 - BIDDING AND CONTRACT REQUIREMENTS</u>	
00010	Invitation to Bid..... 00010-1 to 00010-2
00100	Instructions to Bidders..... 00100-1 to 00100-11
00200	Check List for Bidders..... 00200-1 to 00200-2
00300	Bid Form 00300-1 to 00300-5
00301	Bid Bond 00301-1
00302	Consent of Surety 00302-1
00302A	Surety Disclosure Statement and Certification 00302A-1 to 00302A-2
00303	Bidder's Affidavit..... 00303-1
00304	Non-Collusion Affidavit..... 00304-1
00305	Statement of Ownership 00305-1 to 00305-2
00306	Affirmative Action Affidavit..... 00306-1 to 00306-2
00307	Acknowledgement of Receipt of Changes to Bid Document Form..... 00307-1
00308	Certification of Non-Segregated Facilities..... 00308-1
00309	Certification of Bidder's Status 00309-1
00400	Bidder's Qualification Form..... 00400-1 to 00400-4
00401	Subcontractor Listing 00401-1
00402	Public Works Contractor Registration..... 00402-1
00403	Certificate of Equal Opportunity 00403-1
00404	Certification of Affirmative Action Plan for Contractors and Subcontractors 00404-1
00405	American Iron and Steel Certification 00405-1
00406	Disclosure of Investment Activities in Iran 00406-1
00500	Contract Agreement..... 00500-1 to 00500-6
00600	Performance and Payment Bonds..... 00600-1
00601	Maintenance Bond..... 00601-1

00602	Environmental Maintenance Bond	00602-1 to 00602-3
00700	General Condition	00700-1 to 00700-68
00800	Supplemental Conditions.....	00800-1 to 00800-33
	<u>Exhibit 1</u>	
-	State Prevailing Wage Rate Determination	174 pages
-	Federal Wage Rates	52 pages
	<u>Exhibit 2</u>	
-	List of Debarred Subcontractors and Contractors	15 pages
	<u>Exhibit 3</u>	
-	Davis Bacon Act – Labor Standard Provisions for Federally Assisted Construction Contracts	9 pages
-	USEPA Attachment 2 – Requirements for Subrecipients that are Government Entities	10 pages
	<u>Exhibit 4</u>	
-	Contract Modification Proposal and Acceptance	4 pages
	<u>Exhibit 5</u>	
-	NJAC 7:22-9 and NJAC 7:22-10.11, 12	15 pages
	<u>Exhibit 6</u>	
-	SED Participation Building Phase Quarterly Report (Form OEO-002).....	7 pages
	<u>Exhibit 7</u>	
-	SED participation Monthly Progress Report (Form OEO-003).....	2 pages
	<u>Exhibit 8</u>	
-	PVSC SED Utilization Plan	2 pages
	<u>Exhibit 9</u>	
-	NJAC 7:14.2	8 pages
	<u>Exhibit 10</u>	
-	NJSA 2A: 44-143, 144	4 pages
	<u>Exhibit 11</u>	
-	List of Drawings	2 pages

DIVISION 01 - DIVISION 16 NOT INCLUDED



CDM Smith
110 Fieldcrest Ave., #8
6th Floor
Edison New Jersey 08837

Date Issued: June 17, 2016

TO: All Plan Holders of Record

RE: Passaic Valley Sewerage Commission
Contract No. A992
Waste Activated Sludge Pumping Station Expansion Project

ADDENDUM NO. 1

This Addendum shall be part of the Contract Documents for the Passaic Valley Sewerage Commission, Waste Activated Sludge Pumping Station Expansion Project, Contract No. A992 as provided in the Instructions to Bidder.

Acknowledge receipt of this Addendum indicating so in the Bid Form. Failure to do so will subject the Bidder to disqualification.

SPECIFICATIONS REVISIONS

SECTION 00300 – Bid Form

Delete the section in its entirety and replace with the attached.

SECTION 00301 – Bid Bond

Delete the section in its entirety and replace with the attached.

SECTION 01025 – Measurement and Payment

Delete the section in its entirety and replace with the attached.

Appendix A – Pump Shop Drawings

Insert the attached after specification section 16020.



DRAWING REVISIONS

None

END OF ADDENDUM NO. 1

SECTION 00300

BID FORM

To: PASSAIC VALLEY SEWERAGE COMMISSION:

Bid Submitted For: CONTRACT NO. A992 – WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION PROJECT

Pursuant to and in compliance with your Invitation to Bid and the Instructions to Bidders relating thereto, the undersigned hereby proposes to furnish all labor, materials, supplies, equipment and other facilities necessary or proper for or incidental to the above Contract, as required by and in strict accordance with the Bidding Documents for the amount named in the proposal hereinafter described. In making this proposal the Bidder hereby declares that all provisions of Addenda which have been issued have been complied with in preparing bids.

Name of Bidder:

Bidder:

(Individual, Partnership, Corporation, Joint Venture; L.L.C. as case may be)

Bidder's Business Address:

Telephone No.: _____ Fax No.: _____

Date of Bid: _____

(If Bidder is an Individual, fill in the following blanks)

Name of Individual:

Residence of Individual:

(If Bidder is a Partnership, fill in the following blanks)

Name and Title of Partner:

(If Bidder is a Corporation, fill in the following blanks)

Organized under the laws of the State of:

Name and Residence of President:

Name and title of person signing this bid form if not President (copy of authority to sign must be attached)

Name and Residence of Secretary:

(If Bidder is a Limited Liability Company, fill in the following blanks)

Formed under the laws of the State of :

Name of Managing Member:

Name and title of person signing this bid form if other then Managing Member (copy of authority to sign must be attached)

The undersigned, as Bidder, declares that he/she is authorized to sign this Bid Form on behalf of Bidder ; that he/she has carefully examined the annexed proposed form of contract and bond and the drawings therein referred to; and that he proposes and agrees, if this proposal is accepted, to contract with the Passaic Valley Sewerage Commission (PVSC), in the form of the copy of the Contract deposited in the office of the PVSC, to perform all the work described in the Contract Specifications in the manner and time therein prescribed, and according to the requirements of the Engineer as therein set forth, and that he will take in full payment therefor the sums, exclusive of all taxes, proposed herein.

If this proposal shall be accepted by the PVSC, and the undersigned shall fail to contract as aforesaid, as specified in the General Conditions according to the address herewith given, that the contract is ready for signature, then the PVSC may at their option determine that the bidder has abandoned the contract and thereupon the proposal and acceptance shall be null and void, and the certified check and/or Bid Bond and the proceeds thereof for _____ dollars (Bid Security) accompanying this proposal shall become the property of the PVSC and additionally the bidder shall be liable to PVSC for any and all damages accruing to PVSC by reason of said default; otherwise the accompanying check and/or Bid Bond, shall be returned to the undersigned.

Signature of Bidder with residence and business address:

Dated: _____ Corporate Seal:

Attest: _____

Name: _____

Print: _____

Title: _____

Other (Specify): _____

THE BIDDER AFFIRMS AND DECLARES:

- A. That he has carefully examined the site of the work and that, from his own personal investigations and research, has satisfied himself as to the nature and location of the work; the character, quality and quantity of existing materials. All difficulties likely to be encountered; the kind and extent of labor, equipment, other facilities needed for the performance of the work; the general and local conditions; and all other items and conditions which may, in any way, affect the work or its performance.
- B. The Bidder also declares that he has carefully examined and fully understands all the component parts of this Contract, that the work can be performed as called for by the Contract, and that he will execute the Contract and will completely perform it in strict accordance with its terms for the prices.
- C. That the Bidder will execute work for the Allowance items as directed by the Engineer. It is also understood and agreed that the Final Contract Payment for allowance Items will be based upon such actual payments, and not on the approximate amount cited herein.
- D. That the Bidder declares the attached "Qualification Form" is in all respects a true and complete statement of the qualifications and financial condition of the Bidder.
- E. The price is exclusive of N.J. State and Federal Taxes.
- F. Prices shall also include all transportation charges on materials removed from site and charges pertaining to disposal and other costs pertaining to the execution of the work.
- G. He shall maintain for the duration of the work to be done under this contract, insurance in the amounts specified in the Contract. Upon execution of the Contract, the contractor shall furnish all certificates of insurance as required and set forth herein.
- H. That he understands and agrees to the conditions for liquidated damages.
- I. Upon completion, inspection and acceptance by P.V.S.C. of the work, CONTRACTOR shall turn over to P.V.S.C. the Maintenance Bond (Specification Section 00601) for the one (1) year Correction Period specified in the Contract Documents.
- J. The Bidder has clearly marked on the outside of the sealed envelope that contains his/her bid, the Bidder's name, contract name and number, and bid opening date.

DETERMINATION OF LOW BID. Determination of low bid will be made by comparing the total estimated bid price, which shall include the lump sum bid price and allowance.

A BID ON CONTRACT NO. A992

WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION PROJECT

ITEM	QUANTITY	LUMP SUM OR UNIT PRICE WRITTEN IN WORDS	BID PRICE WRITTEN IN FIGURES	
			Dollars	Cents
1	LUMP SUM	MOBILIZATION Lump Sum (Must be written in words) FOR _____ Dollars Cents		
2	LUMP SUM	WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION Lump Sum (Must be written in words) FOR _____ Dollars Cents		
3	ALLOWANCE	ALLOWANCE FOR PROCUREMENT AND INSTALLATION FOR SEAL WATER BOOSTER SYSTEM FOR <u>ONE HUNDRED THOUSAND</u> <u>ZERO</u> Dollars Cents	\$100,000	00

TOTAL BID PRICE (Sum of Item No. 1 through No. 3) (in Figures) \$ _____

Amount Written:

_____ Dollars and _____ Cents

The "Allowance Items" are intended to provide for work that may later be determined to be necessary for the completion of the project but is not covered in the bid specifications. Written authorization by the OWNER for utilization of any part of the allowances for any such work shall be required.

SECTION 00301

BID BOND

KNOW ALL MEN BY THESE PRESENTS that we, the undersigned, _____, as Principal; and Surety, are hereby held and firmly bound unto the Passaic Valley Sewerage Commission in the penal sum of _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____ 20__.

The condition of the above obligation is such that whereas the Principal has submitted to the Passaic Valley Sewerage Commission a certain Bid, attached hereto, and hereby made a part hereof, to enter into a contract in writing, to:

CONTRACT NO. A992 – WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION PROJECT

NOW THEREFORE,

- A. If said Bid shall be rejected, or, in the alternate,
- B. If said Bid shall be accepted and the Principal shall execute and deliver a contract in the form of CONTRACT attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said CONTRACT, and shall in all other respects perform the agreement created by the acceptance of said Bid.

Then, this obligation shall be void, otherwise the same shall remain in force, and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of time within which the Principal may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have set their hands and seals, and such of them as are corporations having caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal: _____

Surety: _____ by: _____

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The Work shall include furnishing all labor, materials, equipment and incidentals required to complete the work specified herein and shown on the Contract Drawings and all addenda. The Bid Proposal for this Contract is a combination of lump sum costs, unit prices and allowance items.

1.02 MOBILIZATION (Bid Item No. 1)

A. Measurement and Payment

1. Mobilization shall consist of the cost of initiating the contract. Payment for mobilization will be made at the lump sum price bid for this item in the bid form which price shall include the cost of the initiating the contract. The provision for payment for mobilization shall supersede any provisions elsewhere in the specifications for including the costs of these initial services and facilities in the prices bid for the various items scheduled in the proposal. The lump sum price bid for mobilization shall be payable to the CONTRACTOR whenever he shall have completed ten (10) percent of the work of the contract.
2. For the purposes of this item, ten (10) percent of the work shall be considered completed when the total of payments earned, exclusive of the amount bid for this item, shown on the monthly certificates of the approximate quantities of work done, shall exceed ten (10) percent of the total price bid for the contract. The lump sum price bid for mobilization is limited to the following maximum amounts:

Total Original Contract Amount
(including mobilization)

<u>From More Than</u>	<u>To and Including</u>	<u>Maximum Amount for Item Mobilization</u>
\$ 0	\$ 100,000	\$ 3,000
100,000	500,000	15,000
500,000	1,000,000	30,000
1,000,000	2,000,000	60,000
2,000,000	3,000,000	90,000
3,000,000	4,000,000	120,000
4,000,000	5,000,000	125,000
5,000,000	6,000,000	150,000
6,000,000	7,000,000	175,000
7,000,000	10,000,000	200,000
10,000,000	---	2.5% of amount bid

3. Payment under this Item shall be made at the lump sum price bid in accordance with the provisions described herein. No additional payment shall be made for obtaining storage area, access or demobilization.
4. The lump sum price bid for mobilization is limited to percentage allowed by N.J.A.C 7:14-2.9.

1.03 WASTE ACTIVATED SLUDGE (WAS) PUMPING STATION EXPANSION (Bid Item No. 2)

A. Measurement and Payment

1. Measurement for the WAS Pumping Station Expansion will be on a lump sum basis.

Payment for the work shall be made at the lump sum price bid on the Bid Form and shall provide full compensation for furnishing all labor, materials, equipment, and incidentals required to complete the work as specified in Division 1 to and as shown on the Drawings. Payment shall be complete compensation for demobilization, modifications to the pumps and piping including all fittings, support, and appurtenances and other services required for completion of the work. Payment shall also be full compensation for any other work which is not specified or shown but which is required to complete the work as shown on the Drawings and as specified herein.

1.04 ALLOWANCE FOR PROCUREMENT AND INSTALLATION OF SEAL WATER BOOSTER SYSTEM (Bid Item No. 3)

A. Measurement and Payment

1. Measurement for the Allowance for Procurement and Installation of Seal Water Booster System shall be on an as needed basis.
2. Payment for the work shall be made at a price agreed upon by the Owner and shall provide full compensation for furnishing all labor, materials, equipment, and incidentals required to complete the work as necessary. The Allowance for Procurement and Installation of Seal Water Booster System is intended to provide for work that may later be determined to be necessary for the completion of the project but is not covered in the bid specifications. Written authorization by the OWNER for utilization of any part of the allowances for any such work shall be required.

1.05 EXTRA WORK

- A. Extra work, if any, will be performed in accordance with Articles 10, 11 and 12 of the General Conditions of the Contract and will be paid for in accordance with the provisions of those Articles and Article.

PART 2: PRODUCTS (NOT USED)

PART 3: EXECUTION (NOT USED)

END OF SECTION

APPENDIX A

PUMP SHOP DRAWINGS

Transmittal Letter

PASSAIC VALLEY SEWERAGE COMMISSION

600 Wilson Avenue

Newark, NJ, 07105

P. 973-817-5767

E-Mail: klapenta@PVSC.NJ.gov



**Passaic Valley
Sewerage Commission**

To: Terri Steele, Submittals Coordinator

Attention: Terri Steele

Weir Specialty Pumps

CC: Mike Howard/Roseann Pettrow

440 West 800 Sout

Re: PVSC PO # 1500003369

Salt Lake City, UT, 84101-2229

Weir Sales Order # DW10444

Project Name: WAS Station Expansion Project

Document Status Legend

(Refer to documents for specific document status and comments)

- A = Approved
- AN = Approved as Noted
- N = Not Approved
- C = Confirm
- R = Resubmit
- Ack = Acknowledged

Document / DWG. #	Dated	Status	Description	Comments
-	7/22/15	A	Comments	
-	7/28/15	A	Cover Sheet	
-	-	A	Table of Contents	
-	-	A	Sales Order Description	
Pages 1-7, of 7	7/2/15	Ack	Bearing Life & Critical Spd. Calculations	
-	-	A	Spare Parts Provided	
P-25-D408	10/17/13	A	Recommended Spare Parts	
15DW10444BAA	7/28/15	AN	General Arrangement	Add weights: pump, motor & total
15DW10444AA	7/28/15	AN	General Arrangement	Add weight: Bare Pump
-	7/28/15	A	Wet End Assembly	
71884-A Pgs. 1 & 2	7/28/15	A	H4S Bearing Frame Assembly	
C 700793, Pgs. 1 & 2	7/28/15	A	Mechanical Seal Details	Weir-Split Type Final Installed
SD60389-698636-02	7/28/15	AN	Chesterton 'Non-Split' Seal Design Dwg	for test only,submit split version
-	7/2/15	A	Typical Performance Curve Test Report	
GSD-31	6/1/14	A	Limited Warranty	
-	7/28/15	AN	Coupling Data	Include SS - Hubs, Confirm 1.5 S.F.
ECP84406T-4	10/27/14	A	Baldor Motor Product Overview	From Internet Baldor Website
Cat # ECP84406T-4	10/27/14	A	Baldor Motor Data	Advise if Class H insul. available
416820-036	4/30/10	A	A-C Motor Connection Diagram	
416820-068	9/20/12	A	Space Heater Connection Diagram	Advise if separate conduit box available
603866-94	7/28/15	A	Space Heater Flexible Strip	
-	7/20/15	A	Standard Space Heater Elect. Data Chart	
418174-099	9/22/11	A	Winding Thermostats Connection Diag.	
617427-061	7/28/15	A	Baldor Dimensional Drawing	
-	7/28/15	A	Paint-TNEMEC Product Data Sht. Ser. 161	

Comments:

Distribution:

Melissa Sinisgalli	John Rotolo	Chris Coon
Beth Engelbert	John Bolcar	M. Pitbladdo

Kenneth B. LaPenta

SHOP DRAWING REVIEW	
ENGINEER'S REVIEW	RESPONSE REQUIRED BY CONTRACTOR
<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Confirm
<input type="checkbox"/> Approved As Noted	<input type="checkbox"/> Resubmit
<input type="checkbox"/> Not Approved	
<input type="checkbox"/> Comments Attached	
<input type="checkbox"/> Receipt Acknowledged (Not subject to Engineer's Review or Approval)	
<p>The Engineer's review of this shop drawing is limited to the review of dimensions, equipment and materials as presented in the Contract plans, specifications, and for design concept. This review does not relieve the Contractor from errors or omissions in the submittal or from the Contractor's responsibilities of addressing any deviations from the Contract Documents. The Contractor is responsible for the details and dimensions of fabrication and manufacture, the means, methods, techniques, sequences or procedures of construction and performing its work in a safe manner.</p>	
PVSC By: K.B.L.	Date: 8/12/15



Weir Specialty Pumps
440 West 800 South
Salt Lake City, UT 84101-2229

T 801 359 8731
F 801 355 9303
weirsp.com

22JUL 2015

SALES ORDER: DW10444
PURCHASE ORDER: 1500003369
PROJECT NAME: PVSC, NJ Sewage Commission

RE: Comments Received 26JUN15

Response to Engineering Comments:

1. Sales data and cut sheets are modified to clarify data applicable to Sales Order DW10444.
2. An application specific stuffing box drawing is added to the submittal package.
 - a. DWG 700793-1 is to be used in conjunction with DWG 71884 replaces DWG 02547.
 - b. Seal water pressure is 10-15 psi above the pump discharge pressure; somewhere between 75-90psi. The stuffing box pressure is a combination of the suction pressure plus a portion of the discharge pressure but not the full discharge pressure.
 - c. Chesterton seal drawing will be sent when it becomes available.
3. Replaced book curve P25-D119 with application specific curve, including maximum speed of 1785.
4. Added application specific bearing life calculations to submittal package.
5. Deflection information is included in the bearing life calculations. Please refer to #4.
$$L^3/D^4 = (\text{dimension from the seal to the first bearing})^3 / (\text{shaft diameter})^4 = 7.934^3 / 3.35^4 = 3.965$$
6. The Baldor motor is custom and will contain the previously submitted information. Space heater and thermal switch cutsheets are added to the documentation package in the meantime. Motor data included in the final O&M will include the integrated space heater and thermal switch information.
 - a. See 120 V space heater product information. Please refer to Symbol F in documentation.
 - b. The winding thermostats are 3 normally closed snap-action, bi-metallic, temperature actuated switches normally installed in the connection end turns of the motor winding. Division 2 and IEEE 841 motors require hermetically sealed thermostats. See over temperature protection (thermal switches) product information.
 - c. Weir confirms space heaters will be included at no additional cost to PVSC.
 - d. Motor quoted is an IEEE 841 motor; motor manufacturer was unfamiliar with IEEE 842 motor in engineering comments. The conduit boxes on these motors can rotate in 90 degree increments from top-right to top-left. Conduit boxes cannot be placed on top (12 o'clock position) of the motor.



Weir Specialty Pumps
440 West 800 South
Salt Lake City, UT 84101-2229

T 801 359 8731
F 801 355 9303
weirsp.com

7. Weir confirms all products will use stainless steel hardware and abrasion resistant coatings.
8. The application specific seal water pressure is 10-15 psi above the pump discharge pressure. According to the pump curve, if PVSC desires to run the pump at the full range of operation but only has 56 psi available in the plant; a booster pump may be needed.

Pumps tests will occur using seal water pressures within this range. Customer supplied seal water pressures must be within this range.

9. Chesterton 442 seals **WILL BE USED** during pump testing. An "un-split" version of the seal will be installed in the pump under the supervision of the local Chesterton representative. Testing will take place using the un-split seal. After acceptance and shipment of the pump to the installation location, the local Chesterton representative will be called in to split the seal for service.
10. Coupling is revised to be corrosion resistant package stainless steel hubs and hardware. See product data for service factor.

SHOP DRAWING REVIEW	
ENGINEER'S REVIEW	RESPONSE REQUIRED BY CONTRACTOR
<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Confirm
<input type="checkbox"/> Approved As Noted	<input type="checkbox"/> Resubmit
<input type="checkbox"/> Not Approved	<input type="checkbox"/>
<input type="checkbox"/> Comments Attached	<input type="checkbox"/>
<input type="checkbox"/> Receipt Acknowledged (Not subject to Engineer's Review or Approval)	
The Engineer's review of this shop drawing is limited to the review of dimensions, equipment and materials as presented in the Contract plans, specifications, and for design concept. This review does not relieve the Contractor from errors or omissions in the submittal or from the Contractor's responsibilities of addressing any deviations from the Contract Documents. The Contractor is responsible for the details and dimensions of fabrication and manufacture, the means, methods, techniques, sequences or procedures of construction and performing its work in a safe manner.	
PVSC By: K.B.L.	Date: 8/12/15

SHOP DRAWING REVIEW	
ENGINEER'S REVIEW	RESPONSE REQUIRED BY CONTRACTOR
<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Confirm
<input type="checkbox"/> Approved As Noted	<input type="checkbox"/> Resubmit
<input type="checkbox"/> Not Approved	<input type="checkbox"/>
<input type="checkbox"/> Comments Attached	<input type="checkbox"/>
<input type="checkbox"/> Receipt Acknowledged (Not subject to Engineer's Review or Approval)	
<p>The Engineer's review of this shop drawing is limited to the review of dimensions, equipment and materials as presented in the Contract plans, specifications, and for design concept. This review does not relieve the Contractor from errors or omissions in the submittal or from the Contractor's responsibilities of addressing any deviations from the Contract Documents. The Contractor is responsible for the details and dimensions of fabrication and manufacture, the means, methods, techniques, sequences or procedures of construction and performing its work in a safe manner.</p>	
PVSC By: K.B.L.	Date: 8/12/15



RE-SUBMITTAL FOR APPROVAL

**PVSC NJ SEWAGE COMMISSION
PVSC CONTRACT# A992
WASTE ACTIVATED SLUDGE STATION EXPANSION PROJECT**

CUSTOMER ORDER NUMBER: 1500003369
WEMCO ORDER NUMBER: DW10444

WEMCO-HIDROSTAL SCREW CENTRIFUGAL PUMPS
10 X 8 MODEL H8K-M-H4S
WEMCO SERIAL NUMBERS: 15DW10444-01, -02, -03, -04

MANUFACTURER

WEIR SPECIALTY PUMPS
440 WEST 800 SOUTH
SALT LAKE CITY, UT 84101-2229
TELEPHONE: (801) 359-8731
FAX: (801) 530-7828

LOCAL REPRESENTATIVE FOR PARTS AND SERVICE

DAVE HEINER ASSOCIATES, INC.
3799 ROUTE 46, SUITE 102
PARSIPPANY, NJ 07054
TELEPHONE: (973) 299-9990
FAX: (973) 299-9988

TABLE OF CONTENTS

Response to Comments Letter 7/22/15	2 Pages
Contact List	1 Page
Sales Order Description	2 Pages
Bearing Life Calculations	7 Pages
Spare Parts Provided	3 Pages
Recommended Spare Parts	P25-D408
General Arrangement	15DW10444AA
Wet End Assembly	79557
Bearing Frame Assembly	71884
Mechanical Seal Detail Drawing	700793
Chesterton Mechanical Seal Caution Statement	1 Page
Proposal Curve	1 Page
WSP Pump Warranty	GSD-31
Coupling Product Selection	1 Page
Rexnord Viva Coupling Data	15 Pages
Baldor-Reliance Motor Information Packet	16 Pages
ECP84406T-4 Motor Drawings	2 Pages
Chesterton Mechanical Seal Brochure	6 Pages
Chesterton Type 442 Mechanical Seal Technical Data	4 Pages
SpiralTrac Data Version D	4 Pages
Tneme-Fascure Series 161 Paint Data	2 Pages
WEMCO-Hidrostal Pumps Bulletin	P25-B3

SHOP DRAWING REVIEW	
ENGINEER'S REVIEW	RESPONSE REQUIRED BY CONTRACTOR
<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Confirm
<input type="checkbox"/> Approved As Noted	<input type="checkbox"/> Resubmit
<input type="checkbox"/> Not Approved	<input type="checkbox"/>
<input type="checkbox"/> Comments Attached	<input type="checkbox"/>
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PVSC By: K.B.L. Date: 8/12/15	

ATTACHMENTS TO THIS DOCUMENT ARE NOT REPRINTED HERE DUE TO
SIZE

SECTION 00010

INVITATION TO BID

Notice is hereby given for receiving sealed Proposals by the Passaic Valley Sewerage Commission (PVSC) for:

CONTRACT NO. A992

WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION PROJECT

Proposals to be enclosed in opaque sealed envelopes, addressed to the Passaic Valley Sewerage Commission, Purchasing Department, Main Training Room, Warehouse Building, 600 Wilson Avenue, Newark, New Jersey 07105, with name and address of Bidder, Contract Numbers, Contract Name and Bid Opening Date plainly marked outside. Bids will be accepted by mail. They must be sealed and identified as indicated above, enclosed in a mailing envelope with proper postage, and received during the time set for receiving bids. Sealed Bid Proposals shall be received by PVSC's (address above) on December 23, 2015 until 10:00 in the morning, prevailing time for public opening and reading. Bids shall be opened publicly and read aloud after the closing time, 10:00 a.m. All interested parties are invited to attend. The bid opening will take place at PVSC's Main Training Room on the second floor in the Warehouse Building. Bids may be withdrawn or modified prior to the time for the opening of bids or the authorized postponement thereof. No bid may be withdrawn for a period of 60 calendar days after the date of the opening of bids. PVSC reserves the right to reject any and all Bids and waive any Bid informalities, defects or irregularities when it has sound documented business reasons which are in the best interest of PVSC and the project, and the New Jersey Environmental Infrastructure Trust (NJEIT). Any award will be made to the lowest responsible bidder.

No bid will be received unless in writing on the forms furnished, and unless accompanied by bid security in the form of a bid bond, cashier's check, or a certified check made payable to the PVSC in an amount equal to 10% of the amount of the total bid, but not exceeding \$20,000, executed by a Surety Company duly authorized to do business in the State of New Jersey. The successful Bidder must furnish a 100 percent construction performance bond, and a 100 percent construction payment bond, a maintenance bond, and an environmental maintenance bond with a surety company acceptable to the Owner. Complete instruction for preparing Bids and a maintenance bond are included in the Bidding Documents.

Work to be performed under Contract No. A992 includes furnishing all labor, materials, supplies, equipment and other facilities required by the Contract Documents for the complete replacement of PVSC's Waste Activated Sludge (WAS) Pumps located within at the Passaic Valley Sewerage Commission treatment facility. Work includes, but not limited to, temporary bypass piping; demolition of four WAS pumps; demolition and replacement of 12" waste sludge piping and bypass line; installation of four new WAS pumps to be supplied by PVSC, furnishing and installing a magnetic flow meter and other instrumentation, and associated valves and piping as shown in Contract Drawings; and miscellaneous electrical and instrumentation equipment, complete.

A pre-bid meeting and tour of the Project Area will be held on December 9, 2015 at 10:00 AM. The meeting will take place at PVSC's OEM Main Conference Room, second floor, Operations Engineering & Maintenance (OEM) Building, 600 Wilson Avenue, Newark NJ, with site visit to follow. Bidders are strongly recommended to attend the pre-bid meeting and site visit.

Copies of the Bidding Documents will be available at the offices of the PURCHASING DEPARTMENT, PVSC, 600 WILSON AVENUE, NEWARK, NEW JERSEY, 07105 on the date of this advertisement, during regular business hours, 8:15 a.m. and 4:15 p.m. Contact is Mr. Thomas Fuscaldo, Purchasing Agent, of PVSC (973-817-5702). Cost of complete full-sized Bidding Documents is \$100.00 per set (non-refundable) for each set of contract documents ordered payable by business check to Passaic Valley Sewerage Commission. Bidding Documents (i.e. plans and specifications) will be available for examination at the Office of the Purchasing Department at Passaic Valley Sewerage Commission. If for any reason, the Contract is not awarded, refunds of the Bidding Documents fee will be immediately returned to Bidders when the Bidding Documents are returned in reasonable condition within 90 days of notice that the Contract has not been awarded.

All Bidders and their subcontractors of any tier, shall be registered with the New Jersey Department of Labor pursuant to the Public Works Contractor Registration Act, P.L. 1999, c238. A copy of the Bidder's registration certificate shall be provided with each bid.

The Contract is expected to be funded in part with the funds from the NJDEP and the NJEIT. Neither the United States nor the State of New Jersey, the NJEIT, nor any of their departments, agencies, or employees is, or will be, a party to the Contract or any lower tier contract or subcontract. The Contract or Subcontract will be subject to regulations contained in N.J.A.C. 7:22-3.1 et seq., 4.1 et seq., 5.1 et seq., 9.1 et seq. and 10 et seq., Local Public Contract, Department of Labor Current Wage Rate Determination, Prevailing Wage Act, Contract Work Hours and Safety Standard Act, Copland Act, Davis Bacon Act, Buy American Clause, Debarment and Suspension, and Socially and Economically Disadvantaged (SED) (N.J.A.C. 7:22-9.1 et seq.). Pursuant to N.J.A.C. 10:5-33: "Bidders are required to comply with the requirements of P.L. 1975, c.127."

All bidders are encouraged to include a commitment to the use of small, minority, women's and labor surplus area businesses and shall be in conformity with N.J.A.C. 7:22-3.17(a)(24) and 7:22-4.17(a) with a goal of not less than 10% participation of small business enterprises owned and controlled by socially and economically disadvantaged individuals (SED's). Further details regarding special requirements of contractors to comply with the Project Plan developed by the owner for SED participation are included in the Information for Bidders and the Supplemental General Conditions.

Passaic Valley Sewerage Commission
Gregory A. Tramontozzi, Esq.
General Counsel / Acting Clerk

SECTION 00100

INSTRUCTIONS TO BIDDERS

1.01 Defined Terms

Terms used in these Instructions to Bidders have the meanings assigned to them in the General Conditions and Supplemental General Conditions (Specification Sections 00700 and 00800). The "OWNER" is the Passaic Valley Sewerage Commission. The "ENGINEERS" are identified in the Invitation to Bid. The term "Bidder" means one who submits a bid directly to OWNER, as distinct from a sub-bidder, who submits a bid to a Bidder. The term "Successful Bidder" means the Bidder to whom OWNER (on the basis of OWNER'S evaluation) makes an award. The term "Bidding Documents" includes the Contract and Specifications, Contract Drawings and all Addenda issued prior to receipt of Bids.

1.02 Copies of Bidding Documents

- A. Complete sets of the Bidding Documents may be obtained from the ENGINEER as described in the Invitation to Bid. Bidding Documents will be available for examination at the OWNER'S office.
- B. Complete sets of the Bidding Documents must be used in preparing Bids; neither OWNER nor ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- C. OWNER and ENGINEER in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids on the work and do not confer a license or grant for any other use.

1.03 Qualifications of Bidders

- A. To demonstrate qualifications to perform the Work, each Bidder must submit with his Bid a fully completed Bidder's Qualification Form (Specification Section 00400). Failure to submit a completed Bidder's Qualification Form may lead to rejection of the Bid. The information supplied by the Bidder on the Bidder's Qualification Form will be used to ascertain the Bidder's history, reputation, organization and capacity for satisfactory and faithful performance of their work and work of a similar character and will not otherwise be made public, except as provided by law.
- B. OWNER may make such additional investigation as it deems necessary to determine the qualifications of Bidder to perform the Work and Bidder shall furnish to OWNER all such information and data for this purpose as OWNER may request. OWNER reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the OWNER that such Bidder is properly qualified to carry out the obligations of the Agreement, and to complete the Work contemplated therein. Conditional Bids may not be accepted.

1.04 Examination of Contract Documents and Site

- A. It is the responsibility of each Bidder before submitting a Bid to (a) examine the Bidding Documents thoroughly, (b) consider Federal, State and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work, (c) study and carefully correlate Bidder's observations with the Bidding Documents, (d) notify ENGINEER of all conflicts, errors or discrepancies in the Bidding Documents.
- B. On request, OWNER will provide each Bidder access to the site to conduct such investigation and tests, as each Bidder deems necessary for submission of Bidder's Bid.
- C. The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of the Bidding Documents, that without exception the Bid is premised upon performing and, furnishing the Work required by the Bidding Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the Bidding Documents, and that the Bidding Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- D. The specifications provide model numbers, styles or other product references available from various dated and current manufacturer's product literature. In the event such model numbers styles or references no longer exist, the CONTRACTOR is to provide the named manufacturer's most current replacement product available at the time of bid and suitable for the intended application, or the equivalent product of an equal manufacturer. Verification will be required that the referenced equipment is no longer available from the manufacturer.

1.05 Interpretations and Addenda

- A. All questions about the meaning or intent of the Bidding Documents are to be directed to ENGINEER in writing. In addition, questions will also be accepted verbally at the prebid meeting. Interpretations or clarifications and replies considered necessary by ENGINEER, and approved by NJDEP, in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by ENGINEER as having received the Bidding Documents. Questions received less than ten (10) working days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Verbal and other interpretations or clarifications will be without legal effect.
- B. Addenda may also be issued to modify the Bidding Documents as deemed advisable by OWNER or ENGINEER, and as approved by NJDEP. Notice of revisions or addenda to advertisement or Bid Documents relating to Bids shall, no later than seven (7) working days, prior to the date for acceptance of Bids, be made available by notification in writing by Certified Mail, fax, etc. to any person who has submitted a Bid or who has received the Bidding Documents (NJSA 40A: 11-23). Issued addenda become part of the Contract Documents.

1.06 Bid Security

With his Bid, each Bidder shall deliver a Bid Security as stated in the Invitation to Bid and meeting the requirements of the General Conditions and Supplemental General Conditions

(Specification Sections 00700 and 00800). The total Bid (Including Allowances) is the basis for establishing the amount of Bid Security. The Bid Security shall be payable via a certified or bank cashier's check drawn to the order of PVSC or in the form of a Bid Bond executed by a Surety Company duly authorized to do business in the state of New Jersey. The Bid Security shall be in the amount of the lesser of 10% of the amount of the total bid or \$20,000.

OWNER shall award the contract or reject all Bids within such time as may be specified in the Invitation to Bid, except that the Bids of any Bidders who consent thereto may, at the request of the OWNER, be held for consideration for such longer period as may be agreed. All Bid Security, except the security of the three (3) apparent lowest responsible Bidders, shall be returned unless otherwise required by the Bidder, within ten (10) working days after the opening of the Bids and the Bids and such Bidders shall be considered as withdrawn. Within three (3) working days after the awarding and signing of the contract and the approval of the contractor's Performance Bond, the Bid Security of the remaining unsuccessful Bidders shall be returned to them (NJSA 40A: 11-24).

1.07 Contract Time

The numbers of days within which, or the dates by which, the Work is to be substantially completed (the Contract Time) are set forth in the Contract Documents.

1.08 Damages

Provisions for damages are set forth in the Contract Documents.

It is the responsibility of each Bidder before submitting their bid to familiar themselves with the LPCL 40A:11-33 (Forfeiture of deposit in certain cases) and 40A:11-34 (Penalties for false statements) regarding the penalties for falsification with submitting their bid.

1.09 Substitutes or "Or Equal" Items

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or equal" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, applications for such acceptance will not be considered by ENGINEER until after the Effective Date of the Contract. The procedure for submission of any such application by CONTRACTOR and Consideration by ENGINEER is set forth in Article 6 of the General Conditions.

1.10 Subcontractors, Suppliers, and Others

- A. The Bidder shall comply with N.J.S.A. 40A: 11-16, as amended by L1997, C408.
- B. If OWNER or ENGINEER after due investigation has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, either may before the Notice of Award is given, request the apparent Successful Bidder to submit an acceptable substitute without an increase in Bid-price. If apparent Successful Bidder declines to make any such substitution, OWNER may award the contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers and other persons and

organizations. The declining to make requested substitutions will not constitute grounds for sacrificing the Bid Security of any Bidder.

Bidder shall submit with its Bid the "Subcontractor listing" Form in Specification Section 00401. If requested by N.J.S.A. 40A: 11-16, Bidder shall also submit a certificate as provided therein.

1.11 Bid Form

- A. A Bid Form for each Contract is included with the Bidding Documents in Specification Section 00300. All blanks on the applicable Bid Form must be completed in ink or by typewriter.
- B. Attention is directed to the fact that a complete set of Bidding and Contract forms are bound within these Bidding Documents. These forms can be detached.
- C. Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.
- D. Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature, and the official address of the partnership must be shown together with the places of residence for each partner.
- E. Bids by individuals must be executed in the name of individual and shall include his business address and place of residence.
- F. Bids by limited liability companies must be executed in the LLC's name and signed by the managing member, whose title must appear under his signature. The LLC's address and State of formation must be shown below the signature. If a Member other than the managing member of the LLC executes the bid such signature shall be accompanied by evidence of authority to sign.
- G. The Bid constitutes an acknowledgement of receipt of all Addenda, the numbers and dates of which shall be filled in on the Specification Section 00307 Form.
- H. The address, telephone and fax numbers for communications regarding the Bid must be shown.
- I. All names must be typed or printed below the signature, which must be ink to be considered.
- J. A statement of Ownership form and Non-collusion Affidavit must be signed by the Bidder in order for the bid to be considered complete.

1.12 Submission of Bids

Bids shall be submitted at the time and place indicated in the Invitation to Bid and shall be enclosed in an opaque sealed envelope, marked as instructed in the Invitation to Bid and with the name and address of the Bidder and accompanied by the Bid security and other required

documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "Bid Enclosed" on the face of it.

1.13 Modification and Withdrawal of Bids

- A. Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.
- B. Requests for withdrawal of bids after Bid opening due to clerical error shall be made in accordance with appropriate laws.

1.14 Opening of Bids

Bids will be opened as stated in the Invitation to Bid.

1.15 Bids to Remain Subject to Acceptance

All Bids will remain subject to acceptance for sixty (60) calendar days after the day of the Bid opening, but OWNER may, in its sole discretion, release any Bid and return the Bid security prior to that date.

1.16 Rejection of Proposal

The OWNER at its discretion may reject any or all Bids or parts thereof only when it has sound documented business reasons which are in the best interest of the OWNER, the project and the New Jersey Environmental Infrastructure Financing Program. A Bid Proposal may be rejected if the Bid shows any omission, alterations of form, addition or deductions not called for, conditional or uninvited alternate bids, or irregularities of any kind. However, the OWNER reserves the right to waive any informalities, defects or irregularities in Bid proposals.

No contract for work shall be awarded to a contractor or subcontractor who is included on the New Jersey State Treasurer's list of debarred, suspended and disqualified bidders. Submission of false, deceptive, or fraudulent statements or information by bidders shall result in bid rejection or, if applicable, revocation of an awarded contract. Additionally, any such bidder will be subject to the criminal and/or civil penalties provided by all applicable state and federal laws.

1.17 Award of Contract

- A. OWNER may reject bids when it has sound, documented business reasons which are in the best interest of the OWNER. OWNER reserves the right to waive any and all informalities not involving price, time or changes in the Work and to negotiate, to the extent permitted by applicable law contract terms with the Successful Bidder, and the right to disregard all nonconforming, nonresponsive, unbalanced or conditional Bids. Discrepancies in the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between works and figures will be resolved in favor of words and any summations or multiplications recalculated.

- B. In evaluating Bids, OWNER will consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, prices and other data, as may be requested in the Bid Form prior to the Notice of Award.
- C. OWNER may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted. OWNER also may consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.
- D. OWNER may conduct such investigations as OWNER deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of Bidders, proposed Subcontractors, Suppliers and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to OWNER'S satisfaction within the prescribed time.
- E. If the Contract is to be awarded, it will be awarded to the lowest responsible Bidder.

1.18 Contract Security

Article 5 of the General Conditions and the Supplemental General Conditions set forth OWNER'S requirements as to Performance and Payment Bonds (Specification Section 00600). When the Successful Bidder delivers the executed Contract to OWNER, it must be accompanied by the required Performance and Payment Bonds, Insurance, Environmental Maintenance Bond, and Maintenance Bond.

1.19 Signing of Contract

When OWNER gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Contract with all other written Contract Documents attached. Within ten (10) working days thereafter CONTRACTOR shall sign and deliver the required number of counterparts of the Contract and attached documents to OWNER with the required Bonds. Thereafter OWNER shall deliver one (1) fully signed counterpart to CONTRACTOR.

If Successful Bidder shall fail or neglect to sign and execute the Contract and bonds with ten (10) working days after Notice of Award, such failure or neglect may be deemed to be an abandonment and breach of Contract by the Bidder and shall be just cause for an annulment of the award and action for breach of contract. Upon such abandonment, OWNER shall have the authority to make an award to another Bidder or re-advertise for Bids. In addition, OWNER may exclude Bidder from bidding on subsequent PVSC projects for such a period, as the OWNER may deem appropriate. Further, the Bidder improperly failing to execute the contract shall be liable for all damages incurred, including but not limited to:

- The increased contract price incurred in awarding the contract to another Contractor.
- For an amount for any delay caused in said failure at the liquidated per diem rate for delay damages set forth in the Contract.

- The increased administrative and/or consultant costs incurred as a result of said failure.

It is understood and agreed by said Bidder that, upon notice of said failure, the surety shall pay the OWNER the amount provided for the Proposal Guarantee in accordance with the provisions of the Proposal and the OWNER shall be entitled to collect on any certified checks or Proposal, or Performance and Payment Bonds posted as security for execution.

1.20 Pre-bid Meeting

A pre-bid meeting and tour of the Project Area will be held as stated in the Invitation to Bid. The pre-bid meeting is strongly encouraged, not mandatory. Representatives of OWNER and ENGINEER will be present to receive questions verbally on the Project. No technical questions will be answered at the meeting. ENGINEER will transmit to all prospective Bidders of record such Addenda as ENGINEER considers necessary in response to questions arising at the meeting.

1.21 Sales Tax

The OWNER is exempt from payment of sales tax on all materials to be incorporated into the project. CONTRACTOR shall follow requirements in Article 6 of the General Conditions on sales tax.

1.22 Retainage

Provisions concerning retainage are set forth in the General Conditions and Supplemental General Conditions.

1.23 Nondiscrimination Provisions

Bidders are required to comply with all applicable Federal and State Statutes, Rules and Regulations including but not limited to Title VI of the Civil Rights Act of 1964, as amended (42 USC 2000d-2000d-4A) and the discrimination and affirmative action provisions of NJSA 10:2-1 through 10:2-4, the New Jersey Law against Discrimination, NJSA 10: 5-1, et seq., and the rules and regulations promulgated pursuant thereto. Bidders must submit with their bid a signed affidavit stating that it shall comply with the affirmative action program (Specification Section 00306).

Successful Bidders shall, submit a list of all subcontractors who will perform work on the project and written signed statements from authorized agents of the labor pools with which they will or may deal for employees on the work, together with supporting information to the effect that said labor pools will affirmatively cooperate in or offer no hindrance to the recruitment, employment, and equal treatment of employees seeking employment and performing work under the contract or, a certification as to what efforts have been made to secure such statements when such agents or labor pools have failed or refused to furnish same prior to the award of the Contract.

1.24 Collusive Bids

The proposal of any Bidder or Bidders who engage in collusive bidding shall be rejected. Any bidder who submits more than one proposal in such manner as to make it appear that the

proposals submitted are on a competitive basis from different parties shall be considered a collusive bidder. The OWNER may reject the Bid proposals of any collusive Bidder upon Bid opening. However, nothing in this section shall prevent a Bidder from superseding a Bid proposal by a subsequent proposal delivered prior to Bid opening which expressly revokes the previous Bid.

1.25 Wage Determination Rates

The successful bidder will be required to comply with all provisions of prevailing wage rates as determined by the New Jersey Department of Labor.

The CONTRACTOR's attention is directed to the prevailing wage rates contained in Exhibit 1 and to the applicable provisions of the New Jersey Prevailing Wage Act, Chapter 150, of the Laws of 1963 as amended, governing the prevailing rates of wages for workmen who are employed on this project. All applicable provisions of said Prevailing Wage Act and Amendments thereto shall be considered part of this Contract and made a part hereof. The Contractor shall pay not less than the prevailing wage rate to workers employed in the performance of any contract for the project, in accordance with the rate determined by the Commissioner of New Jersey Department of Labor pursuant to N.J.S. A. 34:11-56.25 et seq. OR the United States Secretary of Labor pursuant to 29 CFR Part 5, whichever is greater. The Contractor shall refer to Exhibit 3 of the Supplemental General Conditions for the requirements of the Davis-Bacon Act.

The Bidder does also declare and represent that in the event of any change of such prevailing rates at any time before the execution and delivery of the Contract between the Bidder and the OWNER for the work of construction of the project, or at any time thereafter, the new rates, if applicable, will become minimum rates for work performed thereafter under said Contract. No increase in the Contract price shall be claimed by the Bidder and no such increase will be granted by the OWNER as a result of such change.

In the event it is found that any employee of the Contractor or any subcontractor covered by the contract, has been paid a rate of wages less than the minimum wage required to be paid by the contract, the Owner may terminate the Contractor's or subcontractor's right to proceed with the work, or such part of the work, as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The Contractor and his sureties shall be liable to the local government for any excess costs occasioned thereby.

1.26 Construction Drawings and Specifications Provided by ENGINEER

After the award and prior to signing of the Contract, the OWNER will furnish the successful Bidder with a complete set of conformed drawings "Issued for "Construction". After the Contract has been awarded the CONTRACTOR will be furnished with five (5) sets of conformed drawings "Issued for Construction" and five (5) sets of the Specifications. The CONTRACTOR may purchase additional sets at cost.

1.27 Special Legal Requirements

This Contract will be awarded pursuant to the authority of PVSC's authorizing statute N.J.S.A. 50A:14-1 et seq. ("Authorizing Statute"). Where the Authorizing Statute is silent, it is PVSC's policy to be guided by the provisions of New Jersey Local Public Contracts Law, N.J.S.A. 40A:11 et seq.

Bidders are required to make the good faith efforts to assure that disadvantaged business enterprises, women's business enterprises and labor surplus area firms are used when possible as specified in 40 CFR part 33.

The Contract is expected to be funded in part with the funds from the New Jersey Department of Environmental Protection and the New Jersey Environmental Infrastructure Trust. Neither the United States nor the State of New Jersey, the New Jersey Environmental Infrastructure Trust, nor any of their departments, agencies, or employees is, or will be, a party to the Contract or any lower tier contract or subcontract. The Contract or Subcontract will be subject to regulations contained in N.J.A.C. 7:22-3.1 et seq., 4.1 et seq., 5.1 et seq., 9.1 et seq. and 10 et seq., Local Public Contract, Department of Labor Current Wage Rate Determination, Prevailing Wage Act, Contract Work Hours and Safety Standard Act, Copland Act, Davis Bacon Act, Buy American Clause, Debarment and Suspension, and Socially and Economically Disadvantaged (SED) (N.A.J.C. 7:22-9).

All bids shall include a commitment to the use of small, minority, women's and labor surplus area businesses and shall be in conformity with N.J.A.C. 7:22-3.17(a)(24) and 7:22-4.17(a) with a goal of not less than 10% participation of small business enterprises owned and controlled by socially and economically disadvantaged individuals (SED's). Further details regarding required SED participation are included in the Information for Bidders and the Supplemental General Conditions.

Starting in January 2007, all business entities are advised of their responsibility to file an annual disclosure statement of political contributions with the New Jersey Election Law Enforcement Commission (ELEC) pursuant to N.J.S.A. 19:44A-20.27 if they receive contracts in excess of \$50,000 from public entities in a calendar year. Business entities are responsible for determining if filing is necessary. Additional information on this requirement is available from ELEC at 888-313-3532 or at www.elec.state.nj.us.

Bidder shall submit with their bid an executed "Two-Year Vendor Certification and Disclosure of Political Contributions" form (a copy of which can found at http://www.state.nj.us/treasury/purchase/forms/eo134/c51_eo117_cd_02_10_09.pdf) if the Contractor does not have Two-Year Certification at the time of the Bid, as required by Executive Order 117.

1.28 American Goods and Products to be Used where Possible

In accordance with N.J.A.C. 40A:11-18 only manufactured and farm products of the United States, whenever available, will be used in the Work.

1.29 Public Works Contractor Registration

No contractor shall bid on any contract for public work as defined in section 2 of P.L.1963, c.150 (C.34:11-56.26), amended 2003, c.91., s.2., unless the contractor is registered pursuant to this act. No contractor shall list a subcontractor in a bid proposal for the contract unless the subcontractor is registered pursuant to P.L.1999, c.238 (C.34:11-56.48 et seq.) at the time the bid is made. No contractor or subcontractor, including a subcontractor not listed in the bid proposal, shall engage in the performance of any public work subject to the contract, unless the contractor

or subcontractor is registered pursuant to that act. The Bidder shall submit a copy of the Certificate of Registration issued by the Commissioner of Labor with the Bid.

Each contractor shall, after the bid is made and prior to the awarding of the contract, submit to the public entity the certificates of registration for all subcontractors listed in the bid proposal. Applications for registration shall not be accepted as a substitute for a certificate of registration for the purposes of this section, as required by L.1999,c.238,s.8; amended 2003, c.91., s.4.

1.30 New Jersey Business Registration Requirements

In accordance with P.L. 2004, c.57, no contract shall be entered into by any contracting agency unless the contractor provides proof of business registration at the time a bid is submitted in response to a request for bids. Proof of business registration shall be a copy of a Business Registration Certificate issued by the New Jersey Department of the Treasury, Division of Revenue.

As part of the Bid submission, the Bidder shall include the proofs of all named or listed subcontractors in the Bid including subcontractors listed for minority business enterprise utilization. A Bidder's failure to submit copies of its business registration and the business registrations of the named subcontractors at the time specified by the contracting unit for the receipt of the bids shall be deemed a fatal defect that shall render the bid proposal unresponsive and that cannot be cured by the contracting agency pursuant to N.J.S.A. 40A:11-23.2.

The contractor shall provide written notice to its subcontractors and suppliers of the responsibility to submit proof of business registration to the contractor for submission to Owner/Engineer. The requirement of proof of business registration extends down through all levels (tiers) of the project for all contracts with a value greater than 15 percent of the Owner's bid threshold.

Before final payment on the contract is made by the contracting agency, the contractor shall submit an accurate list and the proof of business registration of each subcontractor or supplier used in the fulfillment of the contract, or shall attest that no subcontractors were used. Contractor shall submit subcontractors' business registration certificate to Owner/Engineer prior to executing subcontract with any subcontractor/vendor who knowingly supplies goods or services to a public agency if the value is greater than 15 percent of the Owner's bid threshold.

For the term of the contract, the contractor and each of its affiliates and a subcontractor and each of its affiliates [N.J.S.A. 52:32-44(g)(3)] shall collect and remit to the Director, New Jersey Division of Taxation, the use tax due pursuant to the Sales and Use Tax Act on all sales of tangible personal property delivered into this State, regardless of whether the tangible personal property is intended for a contract with a contracting agency.

A business organization that fails to provide a copy of a business registration as required pursuant to section 1 of P.L.2001, c.134 (C.52:32-44 et al.) or subsection e. or f. of section 92 of P.L.1977, c.110 (C.5:12-92), or that provides false business registration information under the requirements of either of those sections, shall be liable for a penalty of \$25 for each day of violation, not to exceed \$50,000 for each business registration copy not properly provided under a contract with a contracting agency.

1.31 NJDEP and Environmental Infrastructure Trust Right to Stop Work

The NJDEP may order work to be stopped under this Contract for good cause pursuant to N.J.A.C. 7:22-3.43 and 7:22-4.43. Such stoppage may be treated under the clauses of this Contract, entitled "Suspension of Work and Termination".

1.32 Investment Activities in Iran

In accordance with N.J.S.A. 52:32-58, Bidder shall certify and submit with their bid as set forth therein on a form of Certification promulgated by State of New Jersey Division of Purchase and Property entitled "Disclosure of Investment Activities in Iran". The form of Certification and accompanying list dated January 28, 2013 can be found at http://www.state.nj.us/treasury/purchase/forms/DPA_Form_Packet.pdf (page 6 of 17) and <http://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf>, respectively. **It is the responsibility of Bidder to insure that the most up to date list issued by the Division of Purchase and Property is attached to the Certification submitted with this Bid.**

END OF SECTION

SECTION 00200

CHECK LIST FOR BIDDERS

- A. Failure to submit any items on the checklist below, the receipt of which is mandated by N.J.S.A. 40A:11-1 et seq. will constitute cause for the Bid to be rejected. Failure to submit any other item on the checklist below may be cause for the Bid to be rejected.**

<u>Item</u>	<u>Description of Item</u>	<u>Contract Section</u>	<u>Initial if Completed</u>
1	Bid Form	00300	_____
2	Bid Bond or Certified Check (Bid Guarantee Required by NJSA 40A:11-21)	00301	_____
3	Consent of Surety (NJSA 40A:11-22)	00302	_____
4	Surety Disclosure Statement & Certification	00302A	_____
5	Bidder's Affidavit	00303	_____
6	Non-Collusion Affidavit	00304	_____
7	Statement of Ownership (NJSA 52:25-24.2)	00305	_____
8	Affirmative Action Affidavit	00306	_____
9	If applicable, Acknowledgement of Receipt of Notices or Revisions or Addenda Of an Advertisement, Specifications or Changes to Bid Document Form	00307	_____
10	Certification of Nonsegregated Facilities	00308	_____
11	Certification of Bidder's Status	00309	_____
12	Bidder's Qualification Form	00400	_____
13	Subcontractor Listing (NJSA 40A: 11-16)	00401	_____
14	Business Registration Certificate (NJSA 52:32-44)	(00100, paragraph 1.30)	_____
15	Executive Order 117 Certification	(00100, paragraph 1.27)	_____
16	Public Works Contractor Registration	00402	_____
17	Certificate of Equal Opportunity	00403	_____
18	Certification of Affirmative Action Plan Contractors and Subcontractors	00404	_____
19	American Iron and Steel Certification	00405	_____
20	Disclosure of Investment Activities in Iran (N.J.S.A. 52:32-58)	(00100, paragraph 1.32)	_____

The undersigned hereby acknowledges and has submitted the above listed requirements.

Name of Contractor

Signature of Representative

Print:

Title:

Date:

Note: This form is to help the bidder in preparing his proposal. All information must be filled out in this Section.

END OF SECTION

SECTION 00300

BID FORM

To: PASSAIC VALLEY SEWERAGE COMMISSION:

Bid Submitted For: CONTRACT NO. A992 – WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION PROJECT

Pursuant to and in compliance with your Invitation to Bid and the Instructions to Bidders relating thereto, the undersigned hereby proposes to furnish all labor, materials, supplies, equipment and other facilities necessary or proper for or incidental to the above Contract, as required by and in strict accordance with the Bidding Documents for the amount named in the proposal hereinafter described. In making this proposal the Bidder hereby declares that all provisions of Addenda which have been issued have been complied with in preparing bids.

Name of Bidder:

Bidder:

(Individual, Partnership, Corporation, Joint Venture; L.L.C. as case may be)

Bidder's Business Address:

Telephone No.: _____ Fax No.: _____

Date of Bid: _____

(If Bidder is an Individual, fill in the following blanks)

Name of Individual:

Residence of Individual:

(If Bidder is a Partnership, fill in the following blanks)

Name and Title of Partner:

(If Bidder is a Corporation, fill in the following blanks)

Organized under the laws of the State of:

Name and Residence of President:

Name and title of person signing this bid form if not President (copy of authority to sign must be attached)

Name and Residence of Secretary:

(If Bidder is a Limited Liability Company, fill in the following blanks)

Formed under the laws of the State of :

Name of Managing Member:

Name and title of person signing this bid form if other than Managing Member (copy of authority to sign must be attached)

The undersigned, as Bidder, declares that he/she is authorized to sign this Bid Form on behalf of Bidder ; that he/she has carefully examined the annexed proposed form of contract and bond and the drawings therein referred to; and that he proposes and agrees, if this proposal is accepted, to contract with the Passaic Valley Sewerage Commission (PVSC), in the form of the copy of the Contract deposited in the office of the PVSC, to perform all the work described in the Contract Specifications in the manner and time therein prescribed, and according to the requirements of the Engineer as therein set forth, and that he will take in full payment therefor the sums, exclusive of all taxes, proposed herein.

If this proposal shall be accepted by the PVSC, and the undersigned shall fail to contract as aforesaid, as specified in the General Conditions according to the address herewith given, that the contract is ready for signature, then the PVSC may at their option determine that the bidder has abandoned the contract and thereupon the proposal and acceptance shall be null and void, and the certified check and/or Bid Bond and the proceeds thereof for _____dollars (Bid Security) accompanying this proposal shall become the property of the PVSC and additionally the bidder shall be liable to PVSC for any and all damages accruing to PVSC by reason of said default; otherwise the accompanying check and/or Bid Bond, shall be returned to the undersigned.

Signature of Bidder with residence and business address:

Dated: _____ Corporate Seal:

Attest: _____

Name: _____

Print: _____

Title: _____

Other (Specify): _____

THE BIDDER AFFIRMS AND DECLARES:

- A. That he has carefully examined the site of the work and that, from his own personal investigations and research, has satisfied himself as to the nature and location of the work; the character, quality and quantity of existing materials. All difficulties likely to be encountered; the kind and extent of labor, equipment, other facilities needed for the performance of the work; the general and local conditions; and all other items and conditions which may, in any way, affect the work or its performance.
- B. The Bidder also declares that he has carefully examined and fully understands all the component parts of this Contract, that the work can be performed as called for by the Contract, and that he will execute the Contract and will completely perform it in strict accordance with its terms for the prices.
- C. That the Bidder will execute work for the Allowance items as directed by the Engineer. It is also understood and agreed that the Final Contract Payment for allowance Items will be based upon such actual payments, and not on the approximate amount cited herein.
- D. That the Bidder declares the attached "Qualification Form" is in all respects a true and complete statement of the qualifications and financial condition of the Bidder.
- E. The price is exclusive of N.J. State and Federal Taxes.
- F. Prices shall also include all transportation charges on materials removed from site and charges pertaining to disposal and other costs pertaining to the execution of the work.
- G. He shall maintain for the duration of the work to be done under this contract, insurance in the amounts specified in the Contract. Upon execution of the Contract, the contractor shall furnish all certificates of insurance as required and set forth herein.
- H. That he understands and agrees to the conditions for liquidated damages.
- I. Upon completion, inspection and acceptance by P.V.S.C. of the work, CONTRACTOR shall turn over to P.V.S.C. the Maintenance Bond (Specification Section 00601) for the one (1) year Correction Period specified in the Contract Documents.
- J. The Bidder has clearly marked on the outside of the sealed envelope that contains his/her bid, the Bidder's name, contract name and number, and bid opening date.

DETERMINATION OF LOW BID. Determination of low bid will be made by comparing the total estimated bid price, which shall include the lump sum bid price and allowance.

A BID ON CONTRACT NO. A992

WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION PROJECT

ITEM	QUANTITY	LUMP SUM OR UNIT PRICE WRITTEN IN WORDS	BID PRICE WRITTEN IN FIGURES	
			Dollars	Cents
1	LUMP SUM	MOBILIZATION Lump Sum (Must be written in words) FOR _____ Dollars Cents		
2	LUMP SUM	WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION Lump Sum (Must be written in words) FOR _____ Dollars Cents		
3	ALLOWANCE	ALLOWANCE FOR PROCUREMENT AND INSTALLATION FOR SEAL WATER BOOSTER SYSTEM FOR <u>ONE HUNDRED THOUSAND ZERO</u> Dollars Cents	\$100,000	00

TOTAL BID PRICE (Sum of Item No. 1 through No. 3) (in Figures) \$ _____

Amount Written:

_____ **Dollars and** _____ **Cents**

The “**Allowance Items**” are intended to provide for work that may later be determined to be necessary for the completion of the project but is not covered in the bid specifications. Written authorization by the OWNER for utilization of any part of the allowances for any such work shall be required.

SECTION 00301

BID BOND

KNOW ALL MEN BY THESE PRESENTS that we, the undersigned, _____, as Principal; and _____ Surety, are hereby held and firmly bound unto the Passaic Valley Sewerage Commission in the penal sum of _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____ 20__.

The condition of the above obligation is such that whereas the Principal has submitted to the Passaic Valley Sewerage Commission a certain Bid, attached hereto, and hereby made a part hereof, to enter into a contract in writing, to:

CONTRACT NO. A992 – WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION PROJECT

NOW THEREFORE,

- A. If said Bid shall be rejected, or, in the alternate,
- B. If said Bid shall be accepted and the Principal shall execute and deliver a contract in the form of CONTRACT attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said CONTRACT, and shall in all other respects perform the agreement created by the acceptance of said Bid.

Then, this obligation shall be void, otherwise the same shall remain in force, and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of time within which the Principal may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have set their hands and seals, and such of them as are corporations having caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal: _____

Surety: _____ by: _____

SECTION 00302

CONSENT OF SURETY

KNOW ALL MEN BY THESE PRESENTS, that for and in consideration of the sum of \$1.00, lawful money of the United States, the receipt whereof is hereby acknowledged, paid the undersigned corporation, and for other valuable consideration, the _____
_____(Name of Surety) corporation organized and existing under the laws of the State of _____ and licensed to do business in the State of New Jersey, certifies and agrees, that if CONTRACT NO. A992 – WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION PROJECT is awarded to _____ undersigned corporation will execute the Bond or Bonds as required by the CONTRACT Documents and will become surety in the full amount of the CONTRACT price for the faithful performance of the contract and for payment of all persons supplying labor or furnishing materials in connection hence with.

Signature of Surety by: _____

Print Name: _____

Title: _____

Address: _____

(To be accompanied by the usual proof of authority of officers of surety company to execute the same.)

SURETY DISCLOSURE STATEMENT AND CERTIFICATION

Surety(ies) on the attached bond, hereby certifies(y) the following:

(1) The surety meets the applicable capital and surplus requirements of R.S. 17:17-6 or R.S. 17:17-7 as of the surety's most current annual filing with the New Jersey Department of Insurance.

(2) The capital (where applicable) and surplus, as determined in accordance with the applicable laws of this State, of the surety(ies) participating in the issuance of the attached bond is (are) in the following amount(s) as of the calendar year ended December 31, _____ (most recent calendar year for which capital and surplus amounts are available), which amounts have been certified as indicated by certified public accountants (indicating separately for each surety that surety's capital and surplus amounts, together with the name and address of the firm of certified public accounts that shall have certified those amounts):

(3) (a) With respect to each surety participating in the issuance of the attached bond that has received from the United States Secretary of the Treasury a certificate of authority pursuant to 31 U.S.C. § 9305, the underwriting limitation established therein and the date as of which that limitation was effective is as follows (indicating for each such surety that surety's underwriting limitation and the effective date thereof):

(b) With respect to each surety participating in the issuance of the attached bond that has not received such a certificate of authority from the United States Secretary of the Treasury, the underwriting limitation of that surety as established pursuant to R.S. 17:18-9 as of (date on which such limitation was so established) is as follows (indicating for each such surety that surety's underwriting limitation and the date on which that limitation was established):

(4) The amount of the bond to which this statement and certification is attached is:
\$ _____

SURETY DISCLOSURE STATEMENT AND CERTIFICATION (continued)

(5) If, by virtue of one or more contracts of reinsurance, the amount of the bond indicated under item (4) above exceeds the total underwriting limitation of all sureties on the bond as set forth in items (3)(a) or (3)(b) above, or both, then for each such contract of reinsurance:

(a) The name and address of each such reinsurer under that contract and the amount of that reinsurer's participation in the contract is as follows:

;and

(b) Each surety that is party to any such contract of reinsurance certifies that each reinsurer listed under item (5)(a) satisfies the credit for reinsurance requirement established under P.L.1993, c.243 (C. 17:51B-1 et seq.) and any applicable regulations in effect as of the date on which the bond to which this statement and certification is attached shall have been filed with the appropriate public agency.

CERTIFICATE

(to be completed by an authorized certifying agent
for each surety on the bond)

I _____ (Name of Agent), as _____ (Title of Agent) for
_____ (Name of Surety), a corporation/mutual insurance company/other
(circle one) domiciled in _____ (state of domicile), DO
HEREBY CERTIFY that, to the best of my knowledge, the foregoing statements made by me
are true, and ACKNOWLEDGE that, if any of those statements are false, this bond is
VOIDABLE.

(Signature of certifying agent)

(Printed name of certifying agent)

(Title of certifying agent)

SECTION 00303

BIDDER'S AFFIDAVIT

State of _____)

ss:

County of _____)

_____ being duly sworn, deposes and says that he resides at

_____ that he is the _____ (Title)

of _____ (Name of Bidder)

who signed the above Proposal or Bid, that he was duly authorized to sign, and that the Bid is a true offer of the Bidder, and the seal attached is the seal of the Bidder and that all the declarations and statements contained in the Bid are true to the best of his knowledge and belief.

(Affiant)

Sworn to and subscribed before me

this _____ day of _____, 20__

Notary Public in and for

_____ County, _____

My Commission Expires

_____, 20__

SECTION 00304

NON-COLLUSION AFFIDAVIT

STATE OF NEW JERSEY, COUNTY OF _____ ss.:

I, _____, of the City of _____ in the County of _____ and the State of _____ of full age, being duly sworn according to law on my oath depose and say that:

I am _____ of the firm of _____ the bidder making the Bid for the above-named contract, and that I executed the said Bid with full authority so to do; that said bidder has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the within Contract; and that all statements contained in said Bid and in this Affidavit are true and correct, and made with full knowledge that the **Passaic Valley Sewerage Commission** relies upon the truth of the statements contained in said Bid and in the statements contained in this Affidavit in awarding the Contract.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such Contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employees or bona fide established commercial or selling agencies maintained by the bidder for the purpose of securing business.

For breach or violation of this warranty the Owner shall have the right to annul the Contract without liability or in its discretion to deduct from the Contract price or consideration the full amount of such commission, percentage, brokerage or contingent fee.

(Affiant)

Sworn to and subscribed before me

this ____ day of _____, 20____

Notary Public in and for
_____ County, _____

My Commission Expires
_____, 20____

SECTION 00305

STATEMENT OF OWNERSHIP

Under the provisions of the State Law (NJSA 52:25-24.2. Chapter 33 of the Laws of 1977), a Bidder must file a statement of ownership prior to or with the Bid. The statement must contain the names and addresses of all owners of ten percent (10%) or more of the stock of whatever class of the corporation, or the names of individual partners in the partnership, who own ten percent (10%) or greater interest in the partnership, as the case may be. In order for your Bid to be considered, you must list below the names and addresses of those meeting the criteria of the law:

1. Partners with 10% or greater interest.

If none, so indicate. Do not leave this space blank:

Name

Addresses

2. Owners of 10% or more of the stock of the corporation including stock of all classes.

If none, so indicate. Do not leave this space blank:

Name

Addresses

3. Owners of 10% or more of membership interest in limited liability company:

If none, so indicate. Do not leave this space blank:

Name

Addresses

4. If, under item 2, the name of a partnership, corporation or limited liability company is listed, list below the names of individual partners and/or stockholders of whatever class who own a 10% or greater interest in the partnership, corporation or limited liability company listed under item 2. Disclosure shall be continued until names and address of every non-corporate stockholder, individual partner or member exceeding the 10% membership criteria established in the cited statute has been listed:

If none, so indicate. Do not leave this space blank.

Names

Addresses

Signature: _____
(person who signs Bid proposal)

NOTE: Your attention is directed to the fact that failure to complete the statement of ownership form is a non-waivable deficiency and the Commission in the event of non compliance are required as a matter of law to reject your Bid. All of the information requested is strictly required. Each question must be answered either by providing the requested information or if the answer to the question is "none", that must be written in. If required, attach additional sheets to list all names.

SECTION 00306

AFFIRMATIVE ACTION AFFIDAVIT

(to be completed by firms with more than 50 employees)

_____ of the firm of _____
(name)

being sworn according to law on his oath deposes and says that:

1. I am authorized to make this affidavit on behalf of:

(name of firm)

2. In addition an agreement to comply with an Affirmative Action Program for equal employment opportunity heretofore submitted as part of any pre-qualification statement, or under other conditions of this contract for a similar program, I/we do hereby further affirm that I/we will comply with the rules and regulations which will be promulgated by the State Treasurer as of the effective date therefor pursuant to the Affirmative Action Law (P.L. 1975, c. 127), as amended.

Name and Title

Signature of Authorized Representative

Subscribed and sworn to
before me this _____

day of _____ 20__.

Seal Notary Public of New Jersey

AFFIRMATIVE ACTION AFFIDAVIT

(to be completed by firms with fewer than 50 employees)

I _____, of the (City, Town, Borough) of _____ in the County of _____, State of _____, of full age, being duly sworn according to law on my oath depose and say that:

1. I am _____, of the firm of _____, a bidder making a proposal upon

**CONTRACT NO. A992 – WASTE ACTIVATED SLUDGE PUMPING
STATION EXPANSION PROJECT**

- 2. _____ does not have 50 employees or more inclusive of all officers and employees of every type.
- 3. I am familiar with the affirmative action requirements of P.L. 1975, c. 127 and rules and regulations issued by the Treasurer, State of New Jersey, pursuant thereto.
- 4. _____ has complied with all the affirmative action requirements of the State of New Jersey, including those required by the P.L. 1975. c. 127 and rules and regulations issued by the Treasurer, State of New Jersey, pursuant thereto.
- 5. I am aware that if _____ does not comply with P.L. 1975, c. 127 and rules and regulations issued pursuant thereto, that no monies will be paid by the State of New Jersey, County of _____, (City, Town, Borough) of _____ until an affirmative action plan is approved. I am also aware that the contract may be terminated and the _____, may be debarred from all public contracts, for a period of up to five (5) years.
- 6. In the event my workforce increases to 50 employees, I must contact the State Affirmative Action Office and complete an Employee Information Report.

Name and Title

Signature of Authorized Representative

Subscribed and sworn to
before me this _____

day of _____, 20__.

Seal Notary Public of New Jersey

SECTION 00307

ACKNOWLEDGEMENT OF RECEIPT OF CHANGES TO BID DOCUMENTS FORM

PASSAIC VALLEY SEWERAGE COMMISSION

WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION
(Name of Construction Project)

A992
(Contract No.)

The undersigned bidder hereby acknowledges receipt of the following notices, revisions, or addenda to the bid advertisement, specifications or bid documents. By indicating date of receipt, bidder acknowledges the submitted bid takes into account the provisions of the notices, revision or addendum. Note that the PVSC's record of notice to bidders shall take precedence and that failure to include provisions of changes in a bid proposal may be submit for rejection of the bid.

Addendum No.	How Received (mail, fax, Pick-up, etc)	Date Received

Acknowledgement by bidder:

Name of Bidder: _____

By Authorized Representative:

Signature: _____

Printed Name and Title: _____

Date: _____

SECTION 00308

CERTIFICATION OF NONSEGREGATED FACILITIES

(Applicable to contracts, subcontracts, and agreements with Applicants who are themselves performing federally assisted construction contracts, exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause.)

The Federally assisted Construction Contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The Federally assisted Construction Contractor certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The Federally assisted Construction Contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certificate, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation and entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color or national origin, because of habit, local custom, or otherwise. The Federally assisted Construction Contractor agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000.00 which are not exempt from the provisions of the Equal Opportunity clause; that he will retain such certifications in his files.

Signature

Date

Name and Title of Signer (Please Type)

NOTE: The penalty for making false statements in offers is prescribed in 18 USC 1001.

SECTION 00309

CERTIFICATION OF BIDDER'S STATUS ON
THE STATE TREASURER'S LIST OF
DEBARRED, SUSPENDED AND DISQUALIFIED BIDDERS

STATE OF _____

COUNTY OF _____

I, _____ of the City of, in the State of, _____
full age, being duly sworn according to law on my oath depose and say that:

I am _____ of the firm of _____, the
bidder making the Bid for the above named project; that I executed the said Bid, this
affidavit and all other bidding documents with full authority to do so; and that said bidder
is not now at the time of submission of this bid included on the State of New Jersey
Treasurer's List of Debarred, Suspended and Disqualified Bidders.

By: _____

Date: _____

Deponent's Signature

Deponent's Printed Name and Title

Subscribed and sworn to _____

before me this _____ day of _____, 20____.

Notary Public of
My Commission expires _____, 20____.

SECTION 00400

BIDDER'S QUALIFICATION FORM

1. Name of Contractor _____
2. How many years experience have you had in construction work of the same general type as this Contract? _____
3. Give information about the construction experience of the principals of your present organization who will be involved in the Contract:

Individual's Name	Present Position in Organization	Years of Construction Experience	Size and Type of Work	Proposed Position For This Contract

4. Give information about your present contract workload, or contracts to which you are committed:

Contract Price	Type of Construction	Location Of Work	Percentage Complete	Expected Completion Date	Name and Phone No. of Owner

5. Has your organization, or any other partner thereof, failed to complete a construction contract? ___yes ___no

6. **Provide five (5) references of projects similar in scope and size to that required under this Contract.** Give only engineers, architects or owner's representatives for whom you have done similar work.

<u>Name</u>	<u>Business Address</u>	<u>Telephone</u>	<u>Project</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

7. Is any litigation pending or threatened against your organization?

8. Has your organization been denied award of any construction project where it was the lowest bidder? _____

If yes, give details: _____

9. Give as reference a surety company or companies regarding your organization's financial responsibility and general reliability:

Name of Surety Company _____
Name of Local Agent (if different) _____

Local Address: _____

Telephone _____

Person familiar with Bidder's account: _____

10. Attach a financial statement, audited if available, including your organization's latest balance sheet and income statement, prepared in accordance with generally accepted accounting principles. (This statement shall be for the local firm submitting the Bid, unless the local firm is a branch or subsidiary for which separate accounts are not available, in which case the statement shall be for the organization(s) which will contract to be a guarantor of any contract resulting from this Bid. Attach a notarized statement of an officer of that organization describing the relationship to the local firm, and stating that the organization will act as guarantor of the local firm's contracts.) Any financial statement shall include:

A. Assets list:

1. Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses) _____
2. Net Fixed Assets _____
3. Other Assets _____
4. Total Assets (the sum of A1, A2 and A3) _____

B. Liabilities List:

1. Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provisions for income taxes, advances, accrued salaries and accrued payroll taxes)

2. Other Liabilities (e.g., capital, capital stock, authorized and outstanding share par values, earned surplus and retained earnings)

3. Total Liabilities (the sum of B1 and B2)

C. Net Worth (A4 minus B3) _____

D. Billings: State the firm's average annual billings for the five years prior to the date of this Bid and the total billings for the six months prior to the date of this Bid.

E. State the name and address of the person or firm preparing this financial statement.

F. State the name and address of the person or firm (if any) auditing this financial statement. If this statement was not audited, state "not audited".

11. Give the names and telephone numbers of personnel in your organization authorized to participate in discussions of the proposed contract

Name

Telephone

SECTION 00401

SUBCONTRACTOR LISTING

Failure to complete this Section is cause for the bid to be rejected (See NJSA 40A:11-16).

Before submitting his bid, the Bidder shall completely familiarize himself with Section 40A:11-16 of the New Jersey Local Public Contracts Law (New Jersey Statutes Annotated 40A:11-16). On contracts for the erection, alteration or repair of any public building, if the Bidder will use subcontractors for the plumbing work and gas fitting and all kindred work, steam and hot water heating and ventilating apparatus, steam power plants and kindred work, electrical work, structural steel and ornamental iron work he shall list below the name and address of each subcontractor to be used for these respective and kindred categories of work.

WORK CATEGORY	NAME	ADDRESS
Plumbing and Gas Fitting and all kindred work		
Steam Power Plants, Steam and Hot Water Heating and Ventilating Apparatus and all kindred work		
Electrical Work		
Structural Steel and Ornamental Iron Work		

(Attach additional pages as required)

NOTE: Submission of the names and addresses of the subcontractors required by N.J.S.A. 40A:11-16 is essential and nonwaivable. The names and addresses for subcontractors must be provided for each work category above, otherwise the bid will be deemed nonresponsive. Where **more than one** subcontractor is named for a work category, the bidder must identify, in the Bid, the scope of work that is to be performed by each subcontractor, as required by P.L. 1997, c. 408. Failure to comply with these statutory requirements will result in the Bid being deemed nonresponsive.

Name and Title of Authorized Representative

Signature of Authorized Representative

SECTION 00402

PUBLIC WORKS CONTRACTOR REGISTRATION

1. In accordance with "The Public Works Contractor Registration Act," P.L., 1999, c238 (N.J.S.A. 34:11 – 56.48 et seq.) amended by P.L. 2003, C091

"No contractor shall bid on any contract for public work as defined in section 2 of P.L. 1963, c150 (C34:11 – 56.26) unless the contractor is registered pursuant in this act. No contractor shall list a subcontractor in a bid proposal for the contract unless the subcontractor is registered pursuant to P.L. 1999, c238 (C34:11 – 56.48 et seq.) at the time the bid is made. No contractor or subcontractor, including a subcontractor not listed in the bid proposal, shall engage in the performance of any public work subject to the contract, unless the contractor is registered pursuant to that act." (N.J.S.A./ 34:11 – 56.51)"

"Contractor means a person, partnership, association, joint stock company, trust, corporation, or other legal business entity or successor thereof who enters into a contract which is subject to the provisions of the "New Jersey Prevailing Wage Act," P.L., 1963, c.150, (C.34:11 – 56.25 et seq.) and includes any subcontractor or lower tier subcontractor of a contractor defined herein" (N.J.S.A./ 34:11 – 56.50)

2. Proof of registration is required before an award can be made:

"Each contractor shall, after the bid is made and prior the awarding of the contract, submit to the public entity the certificates of registration for all subcontractors listed in the bid proposal. Applications for registration shall not be accepted as a substitute for a certificate of registration for the purposes of this section." (N.J.S.A. 34:11-56.55)

3. On and after August 16, 2003 Contractors and their listed subcontractors bidding on covered work shall provide proof of the required registration prior to the contract award. [As practical matter, proof of registration should be submitted with the Bid]
4. By signing this form, the Contractor certifies that they shall provide proof of the required registration prior to the contract award.

(Signature) (Date)

(Name and Title of Signer -
Please Type)

END OF SECTION

SECTION 00403

CERTIFICATE OF EQUAL OPPORTUNITY

To: _____
Name of Union or Organization of Workers

The undersigned currently hold contract(s) numbered _____ with
_____ which has received funds from the New Jersey Environmental Infrastructure Trust or
(a) subcontract(s) with a prime contractor of the (grantee).

You are advised that under the provisions of the above contract(s) or subcontract(s) and in accordance with the President's Executive Orders 11246 and 11375, the undersigned is obliged not to discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, sex, affectional or sexual orientation. The undersigned will take affirmative action to ensure that such applicants are recruited and employed, and that employees are treated during employment without regard to their age, race, creed, color, national origin, ancestry, marital status, sex, affectional or sexual orientation. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The undersigned agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

This notice is furnished you pursuant to the provisions of the above contract(s) or subcontract(s) and Executive Orders 11246 and 11375.

/s/ _____
Contractor or Subcontractor

Date

Copies of this notice will be posted by the undersigned in conspicuous places available to employees or applicants for employment.

- END OF SECTION -

CERTIFICATION OF AFFIRMATIVE ACTION PLAN
FOR
CONTRACTOR AND SUBCONTRACTORS

Bidder's Name: _____

Address: _____

The Bidder hereby certifies that it shall comply with and shall require its subcontractors to comply with the discrimination and affirmative action provisions of N.J.S.A. 10:2-1 through 10:2-4, the New Jersey Law Against Discrimination (N.J.S.A. 10:5 et seq.) and the rules and regulations promulgated pursuant thereto, including but not limited to N.J.A.C. 17:27-1 et seq.

An affirmative action plan for construction contractors and subcontractors shall consist of the following elements:

1. Provisions in the construction contract containing language required by N.J.A.C. 17:27-3, 4(a) and N.J.A.C. 17:27-7.4, or
2. 41 CFR Part 60-2 and any existing Federally approved or sanctioned affirmative action program.

(Date)

(Signature)

SECTION 00405

AMERICAN IRON AND STEEL CERTIFICATION

The Contractor acknowledges to and for the benefit of the _____ (“Purchaser”) and the _____ (the “State”) that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as “American Iron and Steel;” that requires all of the iron and steel products used in the project to be produced in the United States (“American Iron and Steel Requirement”) including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney’s fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

ACKNOWLEDGEMENT BY BIDDER:

Name Bidder

Name and Title By Authorized Representative

Signature of Authorized Representative

Date

- END OF SECTION -

DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

Project Name: _____

Bidder Name: _____

PART 1: CERTIFICATION

BIDDERS MUST COMPLETE PART 1 BY CHECKING EITHER BOX

FAILURE TO CHECK ONE OF THE BOXES WILL RENDER THE PROPOSAL NON-RESPONSIVE

Pursuant to Public Law 2012, c.25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete the certification below to attest, under penalty of perjury, that NEITHER the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of Treasury Chapter 25 list as a person or entity engaging in investment activities in Iran. The Chapter 25 list is found on the Division’s website at <http://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf>. Bidders **must** review this list prior to completing the below certification. **Failure to complete the certification will render a bidder’s proposal non-responsive.** If the New Jersey Director of the Division of Purchase and Property finds a person or entity to be in violation of law, he/she shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking suspension of the party.

PLEASE CHECK THE APPROPRIATE BOX:

- I certify, pursuant to Public Law 2012, c.25, that neither the bidder listed above nor any of the bidder’s parents, subsidiaries, or affiliates listed on the N.J. Department of the Treasury’s list of entities determined to be engaged in prohibited activities in Iran pursuant to P.L. 2012, c.25 (“Chapter 25 List”). I further certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. I will skip Part 2 and sign and complete the Certification below: OR**
- I am unable to certify as above because the bidder and/or one of its parents, subsidiaries, or affiliates is listed on the Department’s Chapter 25 List. I will provide a detailed, accurate and precise description of the activities in Part 2 below and sign and complete the Certification below. Failure to provide such will result in the proposal being rendered as non-responsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.**

PART 2: PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN.

You must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran outlined above by completing the boxes below.

PLEASE PROVIDE THOROUGH ANSWERS TO EACH QUESTION. IF YOU NEED ADDITIONAL ROOM, ADD ADDITIONAL PAGES.

Name _____ Relationship to Bidder/Owner _____

Description of Activities _____

Duration of Engagement _____ Anticipated Cessation Date _____

Bidder/Offeror Contact Name _____

Certification: I, being duly sworn upon my oath, hereby represent and state that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I attest that I am authorized to execute this certification on behalf of the above-referenced person or entity. I acknowledge that the State of New Jersey and the Owner of the project are relying on the information contained herein and thereby acknowledge that I am under a continuing obligation from the date of this certification through the completion of any contracts with the State of New Jersey and the Owner to notify the State of New Jersey and the Owner in writing of any changes to the answers of information contained herein. I acknowledge that I am aware of that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I recognize that I am subject to criminal prosecution under the law and that it will also constitute a material breach of my agreement(s) with the State of New Jersey and/or the Owner and that the State and/or the Owner at its option may declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print): _____ Signature: _____

Title: _____ Date: _____

SECTION 00500

CONTRACT NO. A992
PASSAIC VALLEY SEWERAGE COMMISSION
600 WILSON AVENUE
NEWARK, NEW JERSEY 07105

CONTRACT AGREEMENT

WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION PROJECT

THIS AGREEMENT, made and executed this ____ day of _____, 20____, by and between the PASSAIC VALLEY SEWERAGE COMMISSION, a corporate body politic of the State of New Jersey, hereinafter called the "OWNER", acting through its Chairman, and _____, a corporation chartered under the laws of the State of ____ partnership, individual with principal offices at hereinafter called the "CONTRACTOR". OWNER and CONTRACTOR, in consideration of the mutual covenants, hereinafter set forth, agree as follows:

Article 1 - Work

In consideration of the payments to be made as hereinafter provided, and of the performance by OWNER of all the matters and things to be performed by OWNER and herein provided; CONTRACTOR agrees, at its own sole cost and expense, to perform all the labor and services and to furnish all labor, materials, plant and equipment necessary to complete, and to complete in good, substantial, workmanlike and approved manner, all the Work as specified, described or indicated in the Contract Documents, as defined herein and Addenda within the time hereinafter specified and in accordance with the terms, conditions and provisions of the Contract Documents and Addenda.

Article 2 - ENGINEER

The Project has been designed by CDM Smith Inc., 110 Fieldcrest Ave., #8, 6th Floor Edison, New Jersey 08837, who are hereinafter called ENGINEER and who are to act as OWNER's representative, assume all duties and responsibilities and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

Article 3 - Contract Times

The CONTRACTOR shall commence work on the day specified in the Notice to Proceed. TIME BEING OF THE ESSENCE of this Contract. The CONTRACTOR shall prosecute the work diligently and uninterruptedly, at a rate to ensure completion sufficient for final acceptance of all work within 210 consecutive calendar days and substantial complete with 180 consecutive calendar days from the day of the CONTRACTOR's receipt of the written Notice to Proceed.

Time is of the essence for final completion of all work within the time period starting from the CONTRACTOR's receipt of the Notice to Proceed and for intermediate completion of the work by the above Intermediate Completion Times.

Article 4 - Contract Price

OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents in current funds at the prices agreed upon in the CONTRACTOR's Bid Form attached to this Agreement.

Article 5 - Payment Procedures

OWNER will make partial payments on account of the Contract in accordance with the provisions of Article 14 in the General Conditions.

Article 6 - CONTRACTOR's Representations

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

- 6.1 CONTRACTOR has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance of or furnishing of the Work.
- 6.2 CONTRACTOR has given ENGINEER written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.
- 6.3 CONTRACTOR is financially solvent and is experienced and competent to perform the type of work or to furnish the plant, materials, supplies or equipment to be performed or furnished by him.

Article 7 - Liquidated Damages and other DAMAGES

The OWNER and CONTRACTOR recognize that TIME IS OF THE ESSENCE of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the Contract Time specified in Article 3, plus any extensions thereof allowed in accordance with the General Conditions. Because some of this damage is difficult or impossible to calculate or estimate, the parties agree that the Contractor shall pay OWNER liquidated damages in the amounts set forth in the Contract Agreement in lieu of the above stated actual damage. The Contractor agrees that as liquidated damages (but not as a penalty) for delay beyond the Contract Times specified in Article 3 above, (Exclusive of Additional) architectural/engineering services as provided for below, the Contractor shall pay the Owner for:

- 7.1 Each and every calendar day that the Contractor is not in compliance with the Contract

Times and Milestones, the sum of One Thousand Five Hundred Dollars (\$1,500.00), which sum is hereby agreed upon, not as a penalty but as liquidated damages, which the parties hereto have agreed to be proper and reasonable, and which the Owner will suffer by reason of such default. The Owner shall assess liquidated damages on each of the contract milestones given in Article 3. The Owner reserves the right to retain and/or release liquidated damages until the Contractor has corrected the delay in the schedule or has met subsequent milestones.

7.2 In addition to liquidated damages the CONTRACTOR shall pay to the OWNER all costs incurred by the OWNER for additional architectural and engineering services required as a result of the delay. This amount, above and beyond the specified liquidated damages amount, shall be determined by and be equal to the actual architectural and engineering services invoices received by the OWNER. Copies of such invoices will be provided to CONTRACTOR. CONTRACTOR shall pay to the OWNER via reduction made by owner from the CONTRACTOR monthly payment request the full amount of each invoice. If unpaid contract balance is insufficient to reimburse OWNER the additional architectural and engineering services invoice amount, CONTRACTOR shall pay OWNER directly any amount not covered by deductions from the contract balance within 30 calendar days from the CONTRACTOR's receipt of a copy of each invoice from the OWNER.

7.3 In the event the Contractor by delay or otherwise has caused Owner damages beyond the amount specified in the liquidated damage provision of any contract between the Owner and Contractor, the Owner shall have the right to seek damages for said additional monies and shall not be limited by any said liquidated damage provision for the amount to be recovered. In addition, the Owner shall have the right to withhold from monies due or to become due the Contractor an amount sufficient to completely pay for said additional damages.

Provided, that CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the Work is for reasons included in Article 12 of the General Conditions. Further, that CONTRACTOR shall, furnish OWNER the required notification of such delays in accordance with Article 12 of the General Conditions.

Article 8 - Contract Documents

The Contract Documents which comprise the Contract between OWNER and CONTRACTOR are attached hereto and made a part hereof and consist of the following:

- 1) Invitation To Bid.
- 2) Instructions To Bidders.
- 3) Bid and any post Bid documentation submitted prior to the Notice of Award.
- 4) This Agreement and Notice to Proceed.
- 5) Construction Performance Bond, Construction Payment Bond and other required Bonds.

- 6) Certificate of Insurance.
- 7) Standard General Conditions, EJCDC Document C700, 2007 edition.
- 8) Supplementary Conditions.
- 9) Specifications (as listed in Table of Contents).
- 10) All drawings (Site and Traffic) inclusive.
- 11) Addenda numbers _____ to _____, inclusive.
- 12) Any modification, including Change Orders, duly delivered after execution of Agreement.

Article 9 - Miscellaneous

- 9.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 9.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 9.3 OWNER and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.
- 9.4 This Agreement shall be construed in accordance with the laws of the State of New Jersey.
- 9.5 CONTRACTOR agrees that:
 - A. It hereby voluntarily and irrevocably submits itself to the jurisdiction and venue of any court of competent jurisdiction over the subject matter of this Agreement located within the State of New Jersey in which any litigation is brought based on or arising out of this Agreement.
 - B. Any legal process or notice connected with any litigation may be served on CONTRACTOR by United States registered mail, postage prepaid, addressed to CONTRACTOR at its address stated in this Agreement for the furnishing of notices to CONTRACTOR or at CONTRACTOR's last known address, and that service in such manner shall constitute good and valid service of process upon CONTRACTOR.

- C. CONTRACTOR hereby waives any defense which might be available to it in any such litigation based on or alleging lack of jurisdiction or venue, or, if process is served in the manner provided in subparagraph "B" immediately above, invalid service of process, and that it will duly enter its appearance in any such action.
- D. This Agreement may be presented in court as conclusive evidence of the foregoing agreement.

IN WITNESS WHEREOF: The parties hereto have executed this agreement the day and year first above mentioned.

PASSAIC VALLEY SEWERAGE COMMISSION

(SEAL)

BY: _____

ATTEST BY: _____
PASSAIC VALLEY SEWERAGE COMMISSION

CONTRACTOR NAME

BY: _____
CONTRACTOR

(SEAL)

ATTEST BY: _____
CONTRACTOR

Note: If CONTRACTOR is a corporation, an affidavit giving the principal the right to sign the Agreement must accompany the executed Agreement.

NAME OF CORPORATION:

BY: _____

(CORPORATE SEAL)

ATTEST BY: _____

(ADD TYPED OR PRINTED NAMES OF OFFICER AND ATTESTING WITNESS)

Date: _____

SECTION 00600
PERFORMANCE AND PAYMENT BONDS

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____, as Principal and _____, a corporation organized and existing under the laws of the State of _____, as surety, are held and firmly bound unto the Passaic Valley Sewerage Commission as hereinafter set forth, in the full and just several sums of:

- (a) _____ (One hundred percent (100%) of the amount of the contract) for faithful PERFORMANCE of the Contract No. A992 – WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION PROJECT;
- b) _____ (One hundred percent (100%) of the amount of the contract) for PAYMENT of labor and materials

Signed this _____ day of _____ 20__.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT, WHEREAS, the above named principal did on the ____ day of _____, 20__, enter into a contract with the Passaic Valley Sewerage Commission, which said contract is made a part of this bond the same as through set forth herein; NOW, if the said principal shall sell and faithfully do and perform the things agreed by the said principal to be done and performed according to the terms of said contract, and shall pay all lawful claims of subcontractors, materialmen, laborers, persons, firms or corporations for labor performed or materials, provisions, provender or other supplies or teams, fuels, oils, implements or machinery furnished, used or consumed in the carrying forward performing or undertaking shall be for the benefit of any subcontractor, materialman, laborer, person, firm or corporation having a just claim, as well as for the obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated. The said surety hereby stipulates and agrees that no modifications, omissions or additions in or to the terms of the said contract or in or to the plans or specifications therefore shall in any way affect the obligation of said surety on its bond.

IN WITNESS WHEREOF, the said _____ as principal has caused its corporate seal to be hereto affixed and these presents to be signed by _____ its _____ and attested by _____ its _____ and the said _____ as surety, has caused its corporate seal to be hereto affixed and these presents to be signed by its _____ and attested by its _____ this _____ day of _____ 20__.

By: _____

Attest: _____

Attest: _____

SECTION 00601

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____, hereinafter called Principal, as Principal, and _____, a corporation of the State of _____, hereinafter called Surety, as Surety, are held and firmly bound unto _____, hereinafter called

Obligee in the sum of _____ DOLLARS, lawful money of the United States of America, to be paid to the said Obligee, or its successors or assigns, to the payment of which sum well and truly to be made, we do bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

SIGNED, sealed and dated this _____ day of _____, 20__

WHEREAS, the Principal entered into a contract with the said Obligee, dated _____

_____ for _____

_____ and

WHEREAS, the Obligee requires that these presents be executed on or before the final completion and acceptance of said contract and

WHEREAS said contract was completed and accepted on the _____ day of

_____, 20__.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the Principal shall remedy, without cost to the Obligee, any defects which may develop during a period of _____ from the date of completion and acceptance of the work performed under the contract, caused by defective or inferior materials or workmanship, then this obligation shall be void; otherwise it shall be and remain in full force and effect.

Attest:

_____ By: _____
Principal

Attest:

_____ By: _____
Surety

SECTION 00602

ENVIRONMENTAL MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that _____

(Name of Contractor)

(Address of Contractor)

_____ a _____
Corporation, Partnership or Individual

hereinafter called Principal, and _____
(Name of Surety)

_____ hereinafter called Surety, are held and firmly bound unto

(Name of Owner)

(Address of Owner)

hereinafter called OWNER, in the penal sum of _____

dollars \$ _____, in lawful money of the United States, for the payment of which sum will and truly to be made, we bind ourselves, successors, and assigns jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____ 20____, a copy of which is hereto attached and made a part hereof for the construction of:

CONTRACT NO. A992

WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION PROJECT

PASSAIC VALLEY SEWERAGE COMMISSION
600 WILSON AVENUE
NEWARK, NEW JERSEY 07105

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice of the Surety and during the one year guaranty period, and during the one year following the guaranty period, and if he shall satisfy all claims and demands incurred under such contract with respect to Environmental sections of the Specifications and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all

outlay and expense which the OWNER may incur in making good any default; then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts,
(number)

each one of which shall be deemed an original, this the _____ day of _____, 20_____.

ATTEST:

(Principal)

(Principal) Secretary

(SEAL)

BY: _____

(Address)

Witness as to Principal

(Address)

(Surety)

ATTEST:

By: _____

Attorney-In-Fact

Witness as to Surety

(Address)

(Address)

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is all partners should execute BOND.

The Environmental Maintenance Bond shall be supplied in the amount of \$25,000 or 50% of the bid price for the materials needed to fulfill the environmental specifications, whichever is greater, when the contract documents are finalized.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the PROJECT is located.

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by

ACEC

AMERICAN COUNCIL OF ENGINEERING COMPANIES



ASCE American Society
of Civil Engineers

P/E National Society of
Professional Engineers
Professional Engineers in Private Practice

AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by



CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474
www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
www.asce.org

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
www.agc.org

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

	Page
Article 1 – Definitions and Terminology	1
1.01 Defined Terms.....	1
1.02 Terminology	5
Article 2 – Preliminary Matters	6
2.01 Delivery of Bonds and Evidence of Insurance.....	6
2.02 Copies of Documents	6
2.03 Commencement of Contract Times; Notice to Proceed.....	6
2.04 Starting the Work	7
2.05 Before Starting Construction	7
2.06 Preconstruction Conference; Designation of Authorized Representatives	7
2.07 Initial Acceptance of Schedules.....	7
Article 3 – Contract Documents: Intent, Amending, Reuse	8
3.01 Intent.....	8
3.02 Reference Standards.....	8
3.03 Reporting and Resolving Discrepancies.....	8
3.04 Amending and Supplementing Contract Documents.....	9
3.05 Reuse of Documents	10
3.06 Electronic Data.....	10
Article 4 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions; Reference Points.....	10
4.01 Availability of Lands	10
4.02 Subsurface and Physical Conditions	11
4.03 Differing Subsurface or Physical Conditions.....	11
4.04 Underground Facilities	13
4.05 Reference Points	14
4.06 Hazardous Environmental Condition at Site.....	14
Article 5 – Bonds and Insurance	16
5.01 Performance, Payment, and Other Bonds	16
5.02 Licensed Sureties and Insurers	16
5.03 Certificates of Insurance	16
5.04 Contractor’s Insurance.....	17
5.05 Owner’s Liability Insurance	18
5.06 Property Insurance	18
5.07 Waiver of Rights	20
5.08 Receipt and Application of Insurance Proceeds.....	21

5.09	Acceptance of Bonds and Insurance; Option to Replace.....	21
5.10	Partial Utilization, Acknowledgment of Property Insurer	21
Article 6 – Contractor’s Responsibilities		22
6.01	Supervision and Superintendence.....	22
6.02	Labor; Working Hours.....	22
6.03	Services, Materials, and Equipment	22
6.04	Progress Schedule	23
6.05	Substitutes and “Or-Equals”	23
6.06	Concerning Subcontractors, Suppliers, and Others.....	25
6.07	Patent Fees and Royalties	27
6.08	Permits.....	27
6.09	Laws and Regulations	27
6.10	Taxes	28
6.11	Use of Site and Other Areas	28
6.12	Record Documents.....	29
6.13	Safety and Protection	29
6.14	Safety Representative.....	30
6.15	Hazard Communication Programs	30
6.16	Emergencies	30
6.17	Shop Drawings and Samples	30
6.18	Continuing the Work.....	32
6.19	Contractor’s General Warranty and Guarantee.....	32
6.20	Indemnification	33
6.21	Delegation of Professional Design Services	34
Article 7 – Other Work at the Site.....		35
7.01	Related Work at Site	35
7.02	Coordination.....	35
7.03	Legal Relationships.....	36
Article 8 – Owner’s Responsibilities.....		36
8.01	Communications to Contractor.....	36
8.02	Replacement of Engineer.....	36
8.03	Furnish Data	36
8.04	Pay When Due	36
8.05	Lands and Easements; Reports and Tests.....	36
8.06	Insurance	36
8.07	Change Orders.....	36
8.08	Inspections, Tests, and Approvals	37
8.09	Limitations on Owner’s Responsibilities	37
8.10	Undisclosed Hazardous Environmental Condition	37
8.11	Evidence of Financial Arrangements	37
8.12	Compliance with Safety Program.....	37
Article 9 – Engineer’s Status During Construction		37
9.01	Owner’s Representative	37
9.02	Visits to Site	37

9.03	Project Representative	38
9.04	Authorized Variations in Work	38
9.05	Rejecting Defective Work	38
9.06	Shop Drawings, Change Orders and Payments.....	38
9.07	Determinations for Unit Price Work	39
9.08	Decisions on Requirements of Contract Documents and Acceptability of Work.....	39
9.09	Limitations on Engineer's Authority and Responsibilities.....	39
9.10	Compliance with Safety Program.....	40
Article 10 – Changes in the Work; Claims		40
10.01	Authorized Changes in the Work	40
10.02	Unauthorized Changes in the Work	40
10.03	Execution of Change Orders.....	41
10.04	Notification to Surety.....	41
10.05	Claims.....	41
Article 11 – Cost of the Work; Allowances; Unit Price Work.....		42
11.01	Cost of the Work.....	42
11.02	Allowances.....	45
11.03	Unit Price Work	45
Article 12 – Change of Contract Price; Change of Contract Times		46
12.01	Change of Contract Price.....	46
12.02	Change of Contract Times	47
12.03	Delays.....	47
Article 13 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work		48
13.01	Notice of Defects	48
13.02	Access to Work	48
13.03	Tests and Inspections	48
13.04	Uncovering Work.....	49
13.05	Owner May Stop the Work.....	50
13.06	Correction or Removal of Defective Work.....	50
13.07	Correction Period	50
13.08	Acceptance of Defective Work.....	51
13.09	Owner May Correct Defective Work	51
Article 14 – Payments to Contractor and Completion.....		52
14.01	Schedule of Values.....	52
14.02	Progress Payments	52
14.03	Contractor's Warranty of Title	55
14.04	Substantial Completion.....	55
14.05	Partial Utilization	56
14.06	Final Inspection.....	56
14.07	Final Payment.....	57
14.08	Final Completion Delayed.....	58
14.09	Waiver of Claims	58

Article 15 – Suspension of Work and Termination	58
15.01 Owner May Suspend Work	58
15.02 Owner May Terminate for Cause	58
15.03 Owner May Terminate For Convenience.....	60
15.04 Contractor May Stop Work or Terminate	60
Article 16 – Dispute Resolution	61
16.01 Methods and Procedures.....	61
Article 17 – Miscellaneous	61
17.01 Giving Notice	61
17.02 Computation of Times	61
17.03 Cumulative Remedies	62
17.04 Survival of Obligations	62
17.05 Controlling Law	62
17.06 Headings.....	62

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 2. a preliminary Schedule of Submittals; and
 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of

the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

- A. Standards, Specifications, Codes, Laws, and Regulations
 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 1. A Field Order;
 2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the

Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

- 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
- 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

- 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
- 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
- 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

- 1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
- 2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other

professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price

or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by

Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
 - 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 - 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property

insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery

against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
1. "*Or-Equal*" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
 - 3) it has a proven record of performance and availability of responsive service.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
- d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and

- 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
 - C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
 - D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
 - E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
 - F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or

other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all

court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor

shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
1. all persons on the Site or who may be affected by the Work;
 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Submit number of copies specified in the General Requirements.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

- a. Submit number of Samples specified in the Specifications.
- b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

- a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
- b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
- c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
- d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop

Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. Engineer's Review:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. Resubmittal Procedures:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 Continuing the Work

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 Contractor's General Warranty and Guarantee

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
 6. any inspection, test, or approval by others; or
 7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor,

Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
 - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 - 3. the extent of such authority and responsibilities will be provided.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits

and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The

opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part;
 2. approve the Claim; or
 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on

Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances:*

1. Contractor agrees that:

- a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
- b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 2. there is no corresponding adjustment with respect to any other item of Work; and
 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

- c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
- d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
- e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the

control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 Notice of Defects

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 Tests and Inspections

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.

- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. repair such defective land or areas; or
 - 2. correct such defective Work; or
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute

resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and

equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 Schedule of Values

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 Progress Payments

A. Applications for Payments:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the

Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. Review of Applications:

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or

- b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due:

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. Reduction in Payment:

- 1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or

- d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities

pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

- A. The making and acceptance of final payment will constitute:
 1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
 2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of Engineer; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

- A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
 1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
 2. agrees with the other party to submit the Claim to another dispute resolution process; or
 3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00800

SUPPLEMENTAL GENERAL CONDITIONS

<u>Article</u>	<u>Title</u>	<u>Page No.</u>
1	Definitions and Terminology	00800-3
2	Preliminary Matters.....	00800-3
3	Contract Documents: Intent, Amending and Reuse.....	00800-5
4	Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions; Reference Points	00800-5
5	Bonds and Insurance	00800-6
6	CONTRACTOR's Responsibilities	00800-9
7	Other Work at the Site.....	00800-13
8	OWNER's Responsibilities.....	00800-14
9	ENGINEER's Status During Construction	00800-14
10	Change in the Work; Claims	00800-15
11	Cost of Work; Allowances; Unit Price Work.....	00800-15
12	Change of Contract Price; Change of Contract Times	00800-16
13	Tests and Inspections; Correction, Removal or Acceptance of Defective Work.....	00800-16
14	Payments to CONTRACTOR and Completion	00800-17
15	Suspension of Work and Termination.....	00800-21
16	Dispute Resolution.....	00800-22
17	Miscellaneous.....	00800-22

Additional Articles

18	Liquidated Damages.....	00800-23
19	Federal and State Government Provisions	00800-23
19.01	Affirmative Action Requirements	
19.02	Anti-Discrimination (NJSA 10:2-1)	
19.03	Foreign Corporations (NJSA 14A:13-3)	
19.04	Statement of Ownership (NJSA 52:24-24.2)	
19.05	Use of Domestic Materials (NJSA 52:33-1 to 52:33-3)	
19.06	Prevailing Wage Rates (NJSA 34:11 - 56:25)	
19.07	State Treasurer's List of Debarred, Suspended and Disqualified Bidders (NJSA 34:11)	
19.08	Small Business Concerns Owned and Controlled by Socially and Economically Disadvantaged Individuals (SEDs) (NJAC 7:22-9)	
19.09	Termination of Loans	
19.10	Davis Bacon Act	
19.11	Construction of Wastewater Treatment Facilities (NJAC 7:14-2)	

<u>Exhibit No.</u>	<u>List of Exhibits</u>
1	Prevailing Wage Rates
2	List of Debarred Contractors and Subcontractors
3	Davis Bacon Act – Labor Standards Provisions for Federally Assisted Construction Contracts (EPA Form 5720-4) and USEPA Attachment 6 – Requirements for Subrecipients that are Government Entities
4	Contract Modification Proposal and Acceptance Form
5	NJAC 7:22-9 and NJAC 7:22-10.11, 12
6	SED Participation Building Phase Quarterly Report (Form OEO-002)
7	SED Participation Monthly Progress Report (Form OEO-003)
8	PVSC SED Utilization Plan
9	NJAC 7:14-2
10	NJSA 2A:44-143, 144
11	List of Drawings

SECTION 00800

SUPPLEMENTAL GENERAL CONDITIONS

These Supplemental General Conditions amend or supplement the Standard General Conditions of the Construction Contract (No. C700, 2007 Edition) given as Specification Section 00700 and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

Add the following Section at the beginning of this Article:

1.00 Terms

- A. The terms used in these Supplemental General Conditions which are defined in the Standard General Conditions of the Construction Contract (No. C700, 2007 Edition) given as Specification Section 00700 have the meanings assigned to them in the General Conditions.

1.01 Defined Terms

Definition 18. Omit the word “two”.

Delete Definition 42. in its entirety and replace with the following:

“Specifications – All the terms and stipulations contained in the General Requirements and in the Detailed Specifications. The requirements of the General Requirements shall be considered part of each Item of the Detailed Specifications.”

Definition 43. Omit “Work at the Site” and substitute “on the Project”.

In the second line of Definition 44. Substantial Completion, delete:

“of ENGINEER”, and add “of ENGINEER, and approved by OWNER”

Insert the following at the end of Definition 44. Substantial Completion.

“The date of Substantial Completion shall be certified by the ENGINEER.”

Add the following new definition:

“52. *Conditions of the Contract* - The combined General Conditions and Supplemental General Conditions.”

ARTICLE 2 – PRELIMINARY MATTERS

Add the following Section to the beginning of this Article:

“2.00 *Execution of Agreement*

- A. At least six counterparts of the Agreement will be executed and delivered by the CONTRACTOR to the OWNER within ten (10) working days of the Notice of Award and receipt of Contract Documents by the CONTRACTOR for execution; and thereafter OWNER will execute and deliver one counterpart to CONTRACTOR.”

2.01 *Delivery of Bonds and Evidence of Insurance*

Delete Part B. Evidence of Insurance in its entirety and substitute the following:

- “B. *Evidence of Insurance:* Before any Work at the site is started, Contractor shall deliver to Owner, with copies to Engineer and each additional insured identified in Article 5 of the Supplemental General Conditions, certificates of insurance (and other evidence requested by Owner) which Contractor is required to purchase and maintain in accordance with the requirements of Article 5.”

2.03 *Commencement of Contract Times; Notice to Proceed*

Delete in its entirety and substitute the following:

- “A. Except as otherwise provided in (ii) hereinafter, the Contract Time will commence to run on the day indicated in the Notice to Proceed; but in no event will the Contract Time commence to run later than the ninetieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement. By mutual consent of the parties to the Contract, these time limits may be changed.
- B. Notwithstanding the provisions of subsection (i) above, if award of the Bid is challenged, and the Owner determines that a hearing is required on the challenge, or a Court or governmental entity having jurisdiction issues a stay of the award or performance of the Contract, the Contract Time and Effective Date of the Agreement shall be stayed for the time necessary for Owner to conduct a hearing and make a determination on the challenge and/or the time that the Contract award or performance are stayed by a Court or governmental entity having jurisdiction, not to exceed an additional 180 days.”

2.06 *Pre-construction Conference; Designation of Authorized Representatives*

Delete in its entirety and substitute the following:

- “A. Within ten (10) days after the Contract Times start to run, but before any Work at the site is started, a pre-construction conference shall be attended by, but without limitations to, the following: Contractor’s Representatives, Owner’s Representatives, Utility Companies, the New Jersey Department of Environmental Protection, and all other Regulatory Agencies as required. The conference will establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.05A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment and maintaining required records.”

ARTICLE 3- CONTRACT DOCUMENTS: INTENT, AMENDING AND REUSE

3.01 *Intent*

Add the following subparts to Part A:

- “1. Each and every provision of law and clause required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be physically amended to make such insertion.
2. The Contract Documents indicate the extent and general arrangement of the work. It is the intent of the Contract Documents to obtain an operable Project. Equipment, components, systems, etc., therein shall be made operable by the CONTRACTOR.
3. The Contract Drawings may be supplemented from time to time with additional drawings by the ENGINEER as may be required to illustrate the work or, as the work progresses, with additional Drawings, by the CONTRACTOR, subject to the approval of the ENGINEER. Supplementary Drawings, when issued by the ENGINEER or by the CONTRACTOR, after approval by the ENGINEER, shall be furnished in sufficient quantity to all those who, in the opinion of the ENGINEER, are affected by such Drawings.”

3.03 Reporting and Resolving Discrepancies.

- A. 3. “or should have known.”

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.02 *Subsurface and Physical Conditions*

Part B: In the sixth line delete “The Supplementary Conditions”, and substitute “Contract Documents”

Add the following Paragraph to Section 4.02:

C. It shall be understood and agreed that the CONTRACTOR will not use any of the information made available to him, or obtained in any examination made by him, in any manner as a basis or ground of claim or demand of any nature against the OWNER or the ENGINEER, arising from or by reason of any variance which may exist between the information offered and the actual materials or structures encountered during the construction.

4.04 *Underground Facilities*

Delete Part B. in its entirety and substitute the following:

B. All information given on the Drawings, or in the Contract Documents, relative to subsurface and latent physical conditions or otherwise affecting the

performance of the Work is from the present sources available to the OWNER and the ENGINEER. It is understood and agreed that the OWNER and the ENGINEER do not warrant or guarantee that the materials, conditions, and pipes, or other structures encountered during the construction will be the same as those indicated on the Drawings or in the Contract Documents. Each Bidder must inform himself fully of the conditions relating to the construction and labor under which the work will be performed; and in particular as to subsurface and groundwater conditions; failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of the Contract Documents and to complete the contemplated work for the considerations and he makes his bid with a full knowledge of conditions, and the kind, quality, and quantity of work required.

It is also understood and agreed that the Bidder or the CONTRACTOR will not use any of the information made available to him, or obtained in any examination made by him, in any manner as a basis or ground of claim or demand of any nature against the OWNER or the ENGINEER, arising from or by reason of any variance which may exist between the information offered and the actual materials or structures encountered during construction.

4.05 *Reference Points*

Part A: Add the following after "provide" in the first line:

" , if available,"

Add the following paragraphs:

"B. ENGINEER may check the lines, elevations, reference marks, batter boards, etc., set by CONTRACTOR, and CONTRACTOR shall correct any errors disclosed by such check. Such a check shall not be considered as approval of CONTRACTOR's work and shall not relieve CONTRACTOR of the responsibility for accurate construction of the entire Work. CONTRACTOR shall furnish personnel to assist ENGINEER in checking lines and grades."

"C. No separate payment will be made to the CONTRACTOR for the cost of establishing lines and grades or for the cost of assisting the ENGINEER in checking of such work or for the delay in checking such work, but the cost thereof shall be included in the prices bid for the various items."

4.06 Hazardous Environmental Condition at Site.

G. Omit in its entirety and substitute the following: "Owner, in its sole discretion, shall have the right to dispose of the contamination, either on its own or through an independent Contractor, or negotiate a Change Order with the Contractor.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment and Other Bonds*

Part A: Add the following after "payment bonds" in the first line:

“within ten (10) working days of Notice of Award”.

Delete the second sentence and replace with the following:

“The Performance Bond shall remain in effect until completion and acceptance by the OWNER as specified in paragraph 14.07”.

Add the following Paragraphs to Section 5.01:

“D. As surety that the CONTRACTOR will faithfully maintain the Work during the twelve (12) month Correction Period, the CONTRACTOR agrees to furnish to the OWNER before final payment shall be made under the terms of this Contract, a suitable Maintenance Bond in the amount of one hundred percent (100%) of the Contract price less the amount of the Environmental Maintenance Bond, with a surety company (licensed by the Commissioner of Banking and Insurance of New Jersey), as surety, running from the date of substantial completion to date twelve (12) months after the date of substantial completion and acceptance as herein before described.

The CONTRACTOR shall note that the form of Maintenance Bond shall be approved by the OWNER prior to the execution thereof by the CONTRACTOR and acceptance thereof by the OWNER. Should the CONTRACTOR fail to commence within one week of notice from the OWNER to make the repairs or replacements required under the terms of the Correction Period set forth above, the OWNER may have said replacements made or repairs done and the expense thereof shall paid by the CONTRACTOR or by the CONTRACTOR’s Surety.”

“E. The Environmental Maintenance Bond, furnished by the Contractor shall be supplied in the amount of \$25,000 or 50% of the bid price for the Environmental Protection bid items, whichever is greater, and shall remain in full force and effect for one (1) year beyond the end of the Correction Period”.

5.03 *Certificates of Insurance*

Add the following paragraph to 5.03:

“F. Wherever in this Article the terms “The Insured” and OWNER occurs with respect to coverage in a policy, it shall mean the OWNER and its agent and agencies, all municipalities where work is being performed under the contract, the ENGINEER, and any other parties specifically designated below, who shall be named as insured in each policy issued. The insurance policies required herein shall not contain any Third Party Beneficiary Exclusion. The State of New Jersey and its venues, employees and officers shall be named insured on each certificate of Insurance.”

5.04 *CONTRACTOR’s Insurance*

Add the following to the end of the paragraph of Part A:

“The limits of liability for the insurance required by Paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law:”

Add the following to Part A, Subparts 1 and 2:

"Workers' Compensation		
(1)	Worker's Compensation	Statutory
(2)	Employer's Liability	\$2,000,000"

Add the following to Part A, Subparts 3, 4 and 5:

"Comprehensive General Liability including Premise/Operations; Explosion, Collapse and Underground Property Damage; Products/Completed Operations, Broad Form Contractual, Independent CONTRACTORS; Broad Form Property Damage; and Personal Injury liabilities:

(1)	Bodily Injury:	\$2,000,000 Each Occurrence \$2,000,000 Annual Aggregate
(2)	Property Damage:*	\$1,000,000 Each Occurrence \$2,000,000 Annual Aggregate

*Property Damage shall include Explosion, Collapse and Underground Coverages. Property Damage shall include property in the care, custody and control of the insured.

(3)	Personal Injury, with employment exclusion deleted.	\$2,000,000 Annual Aggregate"
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Add the following to Part A, Subparts 6:

"Comprehensive Automobile Liability including all owned (private and others), hired and non-owned vehicles:

(1)	Bodily Injury	\$1,000,000 Each Person \$2,000,000 Each Accident
(2)	Property Damage	\$1,000,000 Each Occurrence"

Add the following Paragraph to Part B:

"7. CONTRACTOR may purchase and maintain excess liability insurance in the umbrella form in order to satisfy the limits of liability required for the insurance to be purchased and maintained in accordance with paragraph 5.04. Evidence of such excess liability shall be delivered to OWNER in accordance with paragraph 5.03 in the form of a certificate indicating the policy numbers and limits of liability of all underlying insurance. The umbrella liability insurance shall have a combined single limit of not less than \$5,000,000."

5.05 *OWNER's Liability Insurance*

Delete Part A of Section 5.05 in its entirety and insert the following in its place:

A. CONTRACTOR shall purchase and maintain a separate OWNER's Protective Liability Policy, issued to OWNER at the expense of CONTRACTOR, including

OWNER and ENGINEER as named insured. This insurance shall provide coverage for not less than the following amounts:

- | | | |
|----|-----------------|---|
| 1. | Bodily Injury | \$2,000,000 Each Occurrence |
| 2. | Property Damage | \$1,000,000 Each Occurrence
\$2,000,000 Annual Aggregate |

5.06 *Property Insurance*

Delete the first sentence of Part A and replace with the following:

“CONTRACTOR shall purchase and maintain property insurance upon the Work at the site, written on the completed value form, in an amount equal to the total bid price for the completed construction.”

Add a sentence immediately after the paragraph of Part A, Subpart 2 as follows:

“The policy shall contain endorsements covering damage from flood and earthquake.”

Delete Part B in its entirety.

5.10 *Partial Utilization, Acknowledgement of Property Insurer*

Add a new paragraph as follows:

“B. OWNER will continually occupy all facilities involved in this project and will require temporary access to the Work prior to substantial completion. Endorsements to the property insurance policies provided by the CONTRACTOR that protect the interests of all parties shall be provided.”

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendent*

Add the following:

“C. CONTRACTOR will be held responsible for the conduct of all personnel on site employed by or through Contract. CONTRACTOR shall employ only competent persons to perform the work of this contract. Whenever OWNER shall notify CONTRACTOR, in writing, that any person on the work, including superintendents and other Supervisors, appears to be incompetent, disorderly, or who disregards the authority of the ENGINEER and/or OWNER, or is otherwise unsatisfactory, such person shall be removed from the Project within the time frame specified by the OWNER, and shall not again be employed on it except with the consent of OWNER.”

6.06 *Concerning Subcontractors, Suppliers and Others*

Change this Section Title to read ‘Concerning Assignment, Subcontractors, Suppliers and Others.’”

Add the following to Part A:

"CONTRACTOR shall not assign, transfer, convey or otherwise dispose of the Contract, or of his legal right, title, or interest in or to the same or to any part thereof, without the prior written consent of the OWNER. CONTRACTOR shall not assign by power of attorney or otherwise any monies due him and payable under this Contract without the prior written consent of the OWNER. Such consent, if given, will in no way relieve the CONTRACTOR from any of the obligations of this Contract. OWNER shall not be bound to abide by or observe the requirements of any such assignment. Acceptance of any Subcontractor, other person or organization by OWNER shall not constitute a waiver of any right of OWNER to reject defective work.

The CONTRACTOR agrees that it is as fully responsible to OWNER for the acts and omissions of its Subcontractors and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.

CONTRACTOR shall comply with the New Jersey Regulations governing minority and female CONTRACTOR and subcontractor participation on Construction Contracts as required by NJSA 52:32-17. The regulations, which are more specifically set forth in NJAC 17:14-1.1 et seq., are incorporated herein by reference and made a part hereof."

Add the following changes to Part B:

First line, delete: "If the Supplementary Conditions", and substitute "Contract Documents". The fourth line, delete: "Supplementary Conditions", and substitute "Contract Documents".

6.07 *Patent Fees and Royalties*

Delete Part A in its entirety and substitute the following:

"A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the work of any invention, design, process, products or device which is the subject of patent rights or copyrights held by others. CONTRACTOR shall indemnify and hold harmless OWNER AND ENGINEER and anyone directly or indirectly employed by either of them from and against all claims, damages, losses and expenses, including attorney's fees, arising out of any infringement of patent rights or copyrights incident to the use in the performance of the work or furnished by him in fulfillment of the requirements of this Contract. In the event of any claim or action by law on account of such patents or fees, it is agreed that the OWNER may retain out of the monies which are or which may become due to the CONTRACTOR under this Contract, a sum of money sufficient to protect itself against loss, and to retain the same until said claims are paid or satisfactorily adjusted."

6.09 *Laws and Regulations*

Delete Part B in its entirety and substitute the following:

"B. If CONTRACTOR observes that the Specifications or Drawings are at variance with any Laws or Regulations, he shall give ENGINEER prompt written notice thereof. If CONTRACTOR performs any work knowing it to be contrary to such Laws or Regulations, and without such notice to ENGINEER, he shall

bear all costs arising therefrom. The CONTRACTOR shall, at all times, observe and comply with and shall cause all his agents and employees and all his Subcontractors to observe and comply with all such existing Laws or Regulations, and shall protect and indemnify the OWNER and the ENGINEER and the municipalities in which work is being performed, and their officers and agents against any claim or liability arising from or based on the violation of any such Law or Regulation, whether by himself or his employees or any of his Subcontractors.”

Add the following paragraph:

“D. The CONTRACTOR shall keep itself fully informed of all existing and future state and Federal Laws and Regulations and Municipal Ordinances and Regulations, in any manner affecting the work and the persons engaged or employed in the work, or the materials used in the work, or in any affecting the performance of the work, either with respect to hours of labor or otherwise, and of all such laws, ordinances, regulations, orders and decrees, and shall protect and indemnify OWNER and their officers and agents against any claims or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by itself, or by its agents or employees.”

6.10 *Taxes*

Add the following to Part A:

“The materials and supplies to be used in the work of this contract are exempt from sales tax of the State of New Jersey. CONTRACTOR shall obtain the proper certificates, maintain the necessary records and otherwise comply with the requirements of state law.”

6.13 *Safety and Protection*

Add the following Paragraph:

“G. The CONTRACTOR throughout the work of this contract shall comply with the OWNER Safety Rules, as well as the Federal Occupational Safety and Health Act and the applicable New Jersey Department of Labor Administrative Codes. The CONTRACTOR shall obtain a copy of the OWNER Safety Rules, these rules, including the wearing of protective head gear, shall be strongly enforced by the CONTRACTOR in respect to his own employees, Subcontractors employees, and other personnel engaged in business with the CONTRACTOR on OWNER’s property.

CONTRACTOR’s (and Subcontractors) personnel when on OWNER property shall prominently display Company name or logo on their safety helmet (hard hat).

The CONTRACTOR is advised of the 15-MPH speed limit on all plant roads, and will be held responsible for his employees (and Subcontractors) compliance with this and all rules for traffic safety in the plant.

All CONTRACTORs personnel shall wear OSHA approved hard hats and shall display a clearly visible company logo on the hat.

The CONTRACTORs attention is directed toward several New Jersey Labor Department Administrative Codes that influence the conduct of his work in specific areas:

1. NJAC 12:100-9 – Work in Confined Space
2. NJAC 12:100-11 – Control of Hazardous Energy
(Electrical energy lockout and other energy sources such as steam, air, liquids)
3. NJAC 7:31-1-6 – Toxic Catastrophe Prevention Act.

Before any work commences on OWNER property, the CONTRACTOR's Superintendent shall contact the OWNER Facility Supervisor at the site. The OWNER Supervisor will inform the CONTRACTOR of the OWNER emergency plant evacuation plan and where he is to assemble his personnel.

The CONTRACTOR shall instruct and show his personnel where to assemble, at the sound of the OWNER emergency evacuation siren. The facility Supervisor will notify the CONTRACTOR's personnel of the emergency evacuation route they are to follow. At the assembly point, the CONTRACTOR's person in charge shall account for all his personnel, supply transportation, and see that they utilize the prescribed evacuation route.

Every third Wednesday of each month at 11:00 a.m. the evacuation siren is put through a test cycle, it is not required to assemble for the test cycle.

Where portions of the work of the contract fall under the authority of these Administrative Codes for Public Employees, the CONTRACTOR shall at all times maintain safety standards for his employees equivalent to that imposed by the Codes. This includes, for example, monitoring of air in confined spaces with appropriate instrumentation for noxious or toxic gases, and lockout of hazardous energy such as electrical, steam, air, or liquids under pressure.

The CONTRACTOR shall be responsible for providing first aid, and emergency medical assistance for any of his employees injured on the work site. The CONTRACTOR shall be responsible for arranging emergency assistance with local hospitals, and/or EMT services. The CONTRACTOR's arrangements shall be submitted in writing, with required telephone numbers to OWNER's Security Department. OWNER Security will summon the CONTRACTOR's emergency personnel, if the CONTRACTOR calls OWNER Security from any in plant telephone.

CONTRACTOR's personnel will not be treated in the OWNER Dispensary for minor injuries, cuts or services."

6.15 *Hazardous Communication Program*

Add the following paragraph:

"B. All hazardous material whether sold, delivered, and/or used to perform a service on the OWNER site, shall be properly labeled in accordance with the New Jersey Worker and Community Right to Know (P.L. 1983, C315, NJSA 34:56A-1 et seq.). The bidder shall provide prior to arrival on site the Material

Safety Data Sheets to the OWNER for all the products that he intends to utilize under this contract.”

6.19 *CONTRACTOR's General Warranty and Guarantee*

After the first sentence of Part A add the following:

“All materials or equipment delivered to the site shall be accompanied by certificates, signed by an authorized officer of the supplier, and notarized guaranteeing that the materials or equipment conform to specification requirements. Such certificates shall be immediately turned over to the OWNER. Materials or equipment delivered to the site without such certificates will be subject to rejection.”

Omit the entire second sentence of Part A.

6.20 *Indemnification*

Delete Part A in its entirety and substitute the following:

“A. To the fullest extent permitted by Laws and Regulations, and except for the willful misconduct of OWNER, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of ENGINEERS, architects, attorneys and other professionals and all court or arbitration of other dispute resolution costs including appeals) caused by, arising out of or resulting from the performance of the Work, provided that any such claim, cost, loss or damage is caused in whole or in part by any negligent act or omission of the CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity.”

Add the following new Paragraphs as follows:

“D. Wherever in this Agreement a provision imposes upon the CONTRACTOR an obligation of indemnification, that obligation shall be as set forth in the preceding paragraphs of this provision. CONTRACTOR acknowledges that it is the intent of the parties that any indemnification obligation imposed upon CONTRACTOR pursuant to any provision of this Agreement shall be the broadest called for under this Agreement.

E. Nothing in the Contract Documents shall create or give to third parties any claim or right of action against the CONTRACTOR, the OWNER or the ENGINEER beyond such as may legally exist irrespective of the Contract.”

ARTICLE 7 – OTHER WORK AT THE SITE

7.02 *Coordination*

Delete this Section in its entirety.

ARTICLE 8 – OWNER’S RESPONSIBILITIES

- 8.02 *Replacement of ENGINEER* Delete this Section in its entirety.
- 8.06 *Insurance* Delete this Section in its entirety.
- 8.11 *Evidence of Financial Arrangements* Delete this Section in its entirety.

ARTICLE 9 – ENGINEER’S STATUS DURING CONSTRUCTION

9.01 *OWNER’s Representative*

Delete Part A in its entirety and substitute the following:

“A. ENGINEER will be the OWNER’s representative during the construction period, and his instructions shall be carried into effect promptly and efficiently.”

9.03 *Project Representative*

Part A: In the first sentence delete “If OWNER and ENGINEER agree” and substitute “At OWNER’s option”.

Add the following paragraphs:

“B. The Resident Project Representative will serve as the ENGINEER’s liaison with the CONTRACTOR, working principally through the CONTRACTOR’s superintendent to assist him in understanding the intent of the Contract Documents.

C. The Resident Project Representative shall conduct on-site observations of the work in progress to confirm that the work is proceeding in accordance with the Contract Documents. He will verify that tests, equipment and systems start-ups and operating and maintenance instructions are conducted as required by the Contract Documents. He will have the authority to disapprove or reject defective work in accordance with Article 13.”

9.09 *Limitations on ENGINEER’s Authority and Responsibilities*

Add the following to Part E:

“Except upon written instructions of the ENGINEER, the Resident Project Representative:

1. Shall not authorize any deviation from the Contract Documents or approve any substitute materials or equipment.
2. Shall not exceed limitations of ENGINEER’s authority as set forth in the Contract Documents.
3. Shall not undertake any of the responsibilities of CONTRACTOR, Subcontractors or CONTRACTOR’s superintendent, or expedite the work.

4. Shall not advise on/or issue directions to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract.
5. Shall not advise on or issue directions as to safety precautions and programs in connection with the work.”

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

Add the following to the end of Part B:

“CONTRACTOR certifies that this claim is made in good faith, that the supporting data are accurate and complete to the best of CONTRACTOR’s knowledge and belief, and that the amount or time requested accurately reflects the contract adjustment for which CONTRACTOR believes OWNER is liable.”

ARTICLE 11 – COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

Delete the fourth sentence in the paragraph of Part A, Subpart 1 in its entirety and replace with the following:

Such employees shall include all labor categories listed in the New Jersey Department of Labor Prevailing Wage Rate Determination.

Delete the second sentence in the paragraph of Part A, Subpart 3 “If required ... be acceptable.”

Delete Part A, Subpart 5a in its entirety.

Add the following before the last sentence of the paragraph of Part A, Subpart 5c:

“These rates shall include all fuel, lubricants, insurance, etc. Equipment rental charges shall not exceed the prorated monthly rental rates listed in the current edition of the “ ‘Compilation’ of Rental Rates for Construction Equipment” as published by the Associated Equipment Distributors. Charges per hour shall be determined by dividing the monthly rates by 176.”

Delete Part A, Subpart 5.f. in its entirety.

Delete Part A, Subpart 5.g. in its entirety.

Delete Part A, Subpart 5.h. in its entirety.

Delete Part A, Subpart 5.I. in its entirety

11.03 *Unit Price Work*

In Part D, Subpart 1, delete “materially and significantly”, and insert “by more than plus or minus twenty percent (20%)”.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change in Contract Price*

Delete part B, Subpart 2 in its entirety and replace with the following:

“2. Where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed upon lump sum which includes an allowance for overhead and profit in accordance with paragraph 12.01.C.2”

Delete Part C, Subpart 1 in its entirety.

Add the following to Part C, Subpart 2.a.:

“CONTRACTOR’s fee shall not be applied to payroll taxes, social security contributions, or unemployment taxes. CONTRACTOR’s fee of fifteen percent shall not be applied to moveable equipment (i.e., cranes, furniture etc.) purchased and supplied to the OWNER under a change in the contract price or a construction allowance. CONTRACTOR will be allowed a five percent fee in this case.”

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.03 *Tests and Inspections*

Delete Part B in its entirety and substitute the following:

“B. OWNER shall employ and pay for all inspections and testing services specifically noted as such in the Contract. All others required shall be the responsibility of the CONTRACTOR.”

Delete Parts C and D in their entirety and substitute the following:

“C. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any work to be specifically inspected, tested or approved by any public entity, CONTRACTOR shall assume full responsibility therefore, pay all costs in connection therewith and furnish ENGINEER the required certificates of inspection, testing or approval.

D. The OWNER reserves the right to independently perform at its own expense, laboratory tests on random samples of material or performance tests on equipment delivered to the site. These tests, if made, will be conducted in accordance with appropriate referenced standards or Specifications requirements. The entire shipment represented by a given sample, samples or piece of equipment may be rejected on the basis of the failure of samples or pieces of equipment to meet specified test requirements. All rejected materials or equipment shall be removed from the site, whether stored or installed in the work, and the required replacement shall be made, all at no additional cost to the OWNER.”

13.05 *OWNER May Stop the Work*

Insert the following in the third line between "Documents," and "OWNER":

"or if the work interferes with the operation of the existing facility

Add the following at the end of the paragraph of Part A.

"If the OWNER stops work under Paragraph 13.05, Contractor shall be entitled to no extension of Contract Time or increase in Contract Price."

13.06 *Corrections or Removal of Defective Work*

Add the following Paragraph:

"C. At any time during the progress of the work and up to the date of final acceptance, the ENGINEER shall have the right to reject any work which does not conform to the requirements of the Contract Documents, even though such work has been previously inspected and paid for. Any omissions or failure on the part of the ENGINEER to disapprove or reject any work or materials at the time of inspection shall not be construed as an acceptance of any defective work or materials."

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

Add the following at the end of the paragraph of Part A:

"The CONTRACTOR shall submit for the ENGINEER's approval, a complete breakdown of all Lump Sum Items in the Proposal. This breakdown, modified as directed by the ENGINEER, will be used as a basis for preparing estimates and establishing progress payments.

14.02 *Progress Payments*

A. Applications for Payments

Delete Subpart 3 in its entirety and substitute the following:

"3. Any Contract, the total price of which exceeds \$100,000.00, entered into by the OWNER involving the construction, reconstruction, alteration, repair or maintenance of any building, structure, facility or other improvement to real property, shall provide for partial payments to be made at least once each month as the work progresses, unless the contractor shall agree to deposit bonds with the contracting unit pursuant to P.L. 1979, c.152 (N.J.S.A.40A:11-16.2)

Application for Progress Payment request shall include the total amount of the work completed to the month prior to date of application for Progress Payment and the amount earned by the CONTRACTOR for the payment period. The payment period may conclude on the last day of the preceding month, or other mutually agreed upon day of the month accompanied by such data and supporting evidence as OWNER or ENGINEER may require.

Forms to be used shall be prepared by the CONTRACTOR and submitted to the ENGINEER for approval.

The OWNER shall withhold two (2) percent of the amount due on each application for Progress Payment pursuant to NJSA 40A:11-16.3, unless the CONTRACTOR makes the deposits referred to in NJSA 40A:11-16.1. Such withholding shall be in addition to any retainage otherwise authorized by law or the Contract Documents.

The OWNER shall make payments to the CONTRACTOR once each month as the work progresses. Payment may be withheld at any time if the work is not proceeding in accordance with the Contract Documents.

The OWNER will not pay for equipment stored on or off-site and payments will be made on completed work only; unless by special approval. Upon application to the OWNER, the OWNER may, at its own discretion, approve payments for stored equipment provided the equipment has been inspected and approved by the ENGINEER at its stored location.

Where instruction manuals and parts list are specified in the Contract Documents. Payment will not be made until approved Instruction Manuals and Parts Lists have been received and approved by OWNER.

The CONTRACTOR shall furnish evidence that payment received on the basis of materials and equipment not incorporated and suitably stored, has in fact been paid to the respective supplier(s) within thirty days of payment by OWNER. Failure to provide such evidence of payment may result in the withdrawal of previous approval(s) and removal of the cost of related materials and equipment from the next submitted application for Progress Payment.

Upon Substantial Completion the retainage withheld by the OWNER pursuant to NJSA 40A:11-16.3 shall be paid to the CONTRACTOR as provided by law. The OWNER may reinstate the retainage if it is determined that the CONTRACTOR is not making satisfactory progress or there is other specific cause for such retainage.

The NJAC 7:14-2.8 requirements will be followed as needed.”

B. Review of Applications:

Add the following to Subpart 1:

“Should CONTRACTOR neglect to pay any undisputed claims, made in writing to OWNER within thirty days after completion of the Work, but continuing unsatisfied for a period of ninety days, OWNER may pay such claim and deduct the amount thereof from the balance due CONTRATOR. OWNER may also, with the written consent of CONTRACTOR, use any monies retained, due, or to become due under this Contract for the purpose of paying for both labor and materials for the Work, for which claims have not been filed.

Security is provided both by the Payment Bond and the power of OWNER to retain any monies for claims, but payment by one shall in no way impair or discharge the liability of the other.

Any and all liens for work and materials may be paid off by OWNER within a reasonable time after filing for record in accordance with State and local laws, a

notice of such liens except where claim on which the lien is filed is being litigated by CONTRACTOR, and in such case OWNER may pay the amount of any final judgement or decree or any such claim within reasonable time after such final judgement or decree shall be rendered.

All monies paid by the OWNER in settlement of liens as aforesaid, with the costs and expenses incurred by OWNER in connection therewith, shall be charged to CONTRACTOR, shall bear interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank, and shall be deducted from the next payment due CONTRACTOR under the terms of this Contract.”

14.03 *CONTRACTOR's Warranty of Title*

Add the following Paragraph to Section 14.03:

“B. The Application for payment shall be accompanied by such data, satisfactory to OWNER, as will establish OWNER'S title to the material and equipment and protect his interest therein, including applicable insurance. Each subsequent Application for Payment shall include an Affidavit of CONTRACTOR stating that all previous progress payments received on account of the work have been applied to discharge in full all of CONTRACTOR's obligations reflected in prior Applications for Payment.

No materials or supplies for the Work shall be purchased by CONTRACTOR or Subcontractor subject to any chattel mortgage or under conditional sales contract or other agreement by which an interest is retained by the seller. CONTRACTOR warrants that he/she has good title to all materials and supplies used by him/her in the Work, free from all liens, claims or encumbrances.

CONTRACTOR shall indemnify and save OWNER harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers or machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. CONTRACTOR shall at OWNER's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If CONTRACTOR fails to do so, then OWNER may, after having served written notice on the said CONTRACTOR either pay unpaid bills, of which OWNER has written notice, direct, or withhold from the CONTRACTOR's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to CONTRACTOR shall be resumed, in accordance with the terms of this Contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon OWNER to either CONTRACTOR or his/her Surety.

In paying any unpaid bills of the CONTRACTOR, OWNER shall be deemed the agent of CONTRACTOR and any payment so made by the OWNER, shall be considered as payment made under the Contract by OWNER to CONTRACTOR and OWNER shall not be liable to CONTRACTOR for any such payment made in good faith.”

14.04 *Substantial Completion*

Delete Parts A, B, and C in its entirety and substitute the following:

“A. CONTRACTOR may, in writing to OWNER and ENGINEER, certify that the entire Project is substantially complete and request that ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, CONTRACTOR and ENGINEER shall make an inspection of the Project to determine the status of completion. If ENGINEER and OWNER do not consider the Project substantially complete, ENGINEER will notify CONTRACTOR in writing giving his reasons therefor. If ENGINEER and OWNER consider the Project substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion and the responsibilities between OWNER and CONTRACTOR for maintenance, heat and utilities. There shall be attached to the certificate a tentative list of items to be completed or corrected before Substantial Completion, and the certificate shall fix the time within which such items shall be completed or corrected, said time to be within Contract Time.”

14.05 *Partial Utilization*

Delete Part A, and its subparts, in its entirety and substitute the following:

“A. Prior to Substantial Completion of the Project, OWNER may advise CONTRACTOR in writing to permit him to use a specified part of the Project which OWNER believes may be used without significant interference with construction of the other parts of the Project. Upon receipt of such notice, CONTRACTOR will certify to OWNER and ENGINEER that said part of the Project is substantially complete and request the ENGINEER to issue a certificate of Substantial Completion for that part of the Project. Within a reasonable time thereafter, OWNER, CONTRACTOR and ENGINEER shall make an inspection of that part of the Project to determine its status of completion. If ENGINEER and OWNER do not consider that it is substantially complete, ENGINEER will notify CONTRACTOR in writing giving his reasons therefor. If ENGINEER and OWNER consider that part of the Project to be substantially complete, ENGINEER will execute and deliver to OWNER and CONTRACTOR a certificate to that effect, fixing the date of Substantial Completion as to that part of the Project, attaching thereto a tentative list of items to be completed or corrected before Substantial Completion of the entire Project and fixing the responsibility between OWNER and CONTRACTOR for maintenance and utilities as to that part of the Project. OWNER shall have the right to exclude CONTRACTOR from any part of the Project which ENGINEER has so certified to be substantially complete, but OWNER shall allow CONTRACTOR reasonable access to complete items on the tentative list.”

14.07 *Final Payment*

Delete Part B, subpart 1 in its entirety and replace with the following:

“B. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation - all as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will indicate in writing a recommendation of payment and

present the Application to OWNER for payment. Thereupon ENGINEER will give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.09. Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application. If the Application and accompanying documentation are appropriate as to form and substance, OWNER shall, within sixty-five days after receipt thereof pay CONTRACTOR the amount recommended by ENGINEER.

No final or semi-final payment shall be made until the CONTRACTOR has executed and delivered a release to OWNER and every member, agent or employee thereof, from all claims and liability to the CONTRACTOR for everything and anything done or furnished, or any act or neglect of OWNER or of any person relating to or affecting the work.

Before final or semi-final payment, the CONTRACTOR shall deliver to OWNER an affidavit of payment of all claims of suppliers and Subcontractors. In the event that any supplier or Subcontractor has not been paid and the claim is disputed by the CONTRACTOR, the CONTRACTOR shall submit all of the facts in its affidavit and OWNER shall be authorized, in the exercise of its discretion, to withhold from the payment the sum of money sufficient to guarantee payment of the claims. Nothing contained herein, however, shall incur any responsibility by OWNER to any materialman or Subcontractor, nor shall anything contained herein give rise to a cause of action by any Subcontractor or supplier against OWNER.

Before final acceptance and final or semi-final payment by OWNER, the CONTRACTOR shall deliver to OWNER a complete release of all liens arising out of the Contract. CONTRACTOR agrees that at no time shall any municipal liens, mechanic's liens, notices of intention, or secured instrument be filed against the work and should OWNER be compelled to remove or discharge a municipal lien, mechanic's lien, notice of intention or secured instrument, the CONTRACTOR shall reimburse OWNER for all costs.

Before final or semi-final payment, the CONTRACTOR shall deliver to OWNER a consent of the Surety to the final payment."

Upon acceptance of the work performed pursuant to the contract for which the CONTRACTOR has agreed to the withholding of payments pursuant to NJSA 40A:11-16.3 a., all amounts being withheld by the contracting unit shall be released and paid in full to the CONTRACTOR within 45 days of the final acceptance date agreed upon by the CONTRACTOR and the OWNER, without further withholding of any amounts for any purpose whatsoever, provided that the contract has been completed as indicated.

Delete Part C in its entirety.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.02 *OWNER may Terminate for Cause*

Add the following subparts to Part A:

“5. If the CONTRACTOR should be adjudged a bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed on account of its insolvency.

6. If the CONTRACTOR should fail to make prompt payment to Subcontractors for material, labor or equipment rental.

7. If CONTRACTOR abandons the Work, or sublets this Contract or any part thereof, without the previous written consent of OWNER, or if the Contract or any claim thereunder shall be assigned by CONTRACTOR otherwise than as herein specified;”

Add the following to the end of Part F:

“The termination of the employment of the CONTRACTOR under the provisions of this paragraph shall not relieve the surety of its responsibility”.

Add the following Section to the end of Article 15:

“15.05 *Three (3) Days Notice:*

A. If the CONTRACTOR or his Subcontractors should neglect to prosecute the work properly or fail to perform any provisions of the Contract Documents, the OWNER, after three (3) days written notice to the CONTRACTOR may without prejudice to any other remedy he may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the CONTRACTOR.”

ARTICLE 16 – DISPUTE RESOLUTION

16.01 – *Methods and Procedures*

Delete in its entirety and replace with the following:

“A. All Services under this Contract shall be performed to the satisfaction of the OWNER, which shall in all cases determine the amount and acceptability of the Services which is to be paid for hereunder, and decide all questions which may arise as to the fulfillment of this Agreement on the part of the CONTRACTOR, and its determination and decision thereon shall be final and conclusive, and such determination and decision, in case any question shall arise, shall be a condition precedent to the right of the CONTRACTOR to receive any money hereunder.”

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

Add the following subpart to Part A:

“3. No oral statement of any person whosoever shall in any manner or degree modify or otherwise affect the terms of this Contract. Any notice to the CONTRACTOR, from OWNER and ENGINEER, relative to any part of this Contract shall be in writing.”

Add the following Section to the end of Article 17:

17.07 *CONTRACTOR's Legal Address*

- A. Both the address given in the Bid Form upon which this Agreement is founded, and CONTRACTOR's office at or near the site of the Work are hereby designated as places to either of which notices, letters, and other communications to CONTRACTOR shall be certified, mailed, or delivered. The delivering at the above named place, or depositing in a postpaid wrapper directed to the first-named place, in any post office box regularly maintained by the post office department, of any notice, letter or other communication to CONTRACTOR shall be deemed sufficient service thereof upon CONTRACTOR; and the date of said service shall be the date of such delivery or mailing. The first-named address may be changed at any time by an instrument in writing, executed and acknowledged by CONTRACTOR, and delivered to OWNER and ENGINEER. Nothing herein contained shall be deemed to preclude or render inoperative the service, of any notice, letter, or other communication upon CONTRACTOR personally.

Add the following additional Article:

ARTICLE 18 - LIQUIDATED DAMAGES

18.01 If the CONTRACTOR shall fail to complete the work within the Contract Time, or extension of time granted by the OWNER in accordance with Article 12, then the CONTRACTOR will pay to the OWNER the amount for damages as specified in the Agreement for each calendar day that the Contract work remains incomplete.

18.02 For the purposes of calculating the number of calendar days for damaged assessment, such calculation shall include the day on which date of completion occurs, but shall not include the day of scheduled completion.

18.03 *Penalties and Fines*

In the event OWNER is penalized by any governmental entity, including but not limited to the NJDEP, due to any act or omission by the CONTRACTOR, the CONTRACTOR shall be solely responsible for the payment of same. CONTRACTOR shall reimburse OWNER for payment of any such fine and penalty within ten (10) days of receiving notice of payment of such fine or penalty from OWNER. Any monies paid by the CONTRACTOR pursuant to this provision shall not relieve the CONTRACTOR of liability to OWNER for damages sustained by OWNER by virtue of any other provision of this Agreement.

Add the following additional Article:

ARTICLE 19 - FEDERAL AND STATE GOVERNMENT PROVISIONS

19.01 *Affirmative Action Requirements*

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

- A) The CONTRACTOR or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression,

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

- B) The CONTRACTOR or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the CONTRACTOR, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.
- C) The CONTRACTOR or subcontractor, where applicable, will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer advising the labor union or workers' representative of the CONTRACTOR 's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- D) The CONTRACTOR or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.
- E) When hiring or scheduling workers in each construction trade, the CONTRACTOR or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. 17:27-7.2; provided, however, that the Division may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures prescribed by the following provisions, a, b and c, as long as the Division is satisfied that the CONTRACTOR or subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Division, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with N.J.A.C. 17:27-7.2. The CONTRACTOR or subcontractor agrees that a good faith effort shall include compliance with the following procedures:
 - a) If the CONTRACTOR or subcontractor has a referral agreement or arrangement with a union for a construction trade, the CONTRACTOR or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the CONTRACTOR or subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the CONTRACTOR or subcontractor is unable to obtain said assurances from the construction trade union at least five business

days prior to the commencement of construction work, the CONTRACTOR or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the CONTRACTOR's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the CONTRACTOR or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the CONTRACTOR or subcontractor further agrees to take said action immediately if it determines or is so notified by the Division that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

- b) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the CONTRACTOR does not have a referral agreement or arrangement with a union for a construction trade, the CONTRACTOR or subcontractor agrees to take the following actions:
- 1) To notify the public agency compliance officer, the Division, and minority and women referral organizations listed by the Division pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers;
 - 2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;
 - 3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the CONTRACTOR or subcontractor has a referral agreement or arrangement with a union for the construction trade;
 - 4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the CONTRACTOR or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;
 - 5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and non-discrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;
 - 6) To adhere to the following procedure when minority and women workers apply or are referred to the CONTRACTOR or subcontractor:
 - (i) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the CONTRACTOR or subcontractor shall in good faith determine the qualifications of such individuals. The CONTRACTOR or subcontractor shall hire or schedule those individuals who satisfy appropriate

qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a CONTRACTOR or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Division. If necessary, the CONTRACTOR or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.

(ii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in paragraph (i) above, whenever vacancies occur. At the request of the Division, the CONTRACTOR or subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.

(iii) If, for any reason, said CONTRACTOR or subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the CONTRACTOR or subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Division.

7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Division and submitted promptly to the Division upon request.

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

d) After notification of award, but prior to signing a construction contract, the CONTRACTOR shall submit to the public agency compliance officer and the Division an initial project workforce report (Form AA 201) provided to the public agency by the

Division for distribution to and completion by the CONTRACTOR, in accordance with N.J.A.C. 17:27-7. The CONTRACTOR also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Division and to the public agency compliance officer.

- e) The CONTRACTOR agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-the-job programs for outreach and training of minorities and women.
- f) The CONTRACTOR and its subcontractors shall furnish such reports or other documents to the Division of Public Contracts Equal Employment Opportunity Compliance as may be requested by the Division from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Division of Public Contracts Equal Employment Opportunity Compliance for conducting a compliance investigation pursuant to Subchapter 10 of the Administrative Code (NJAC 17:27).

19.02 *Anti-Discrimination (NJSA 10:2-1)*

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

- a. In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this Contract, no CONTRACTOR, nor any person acting on behalf of such CONTRACTOR or Subcontractor, shall, by reason of race, creed, color, national origin, ancestry, marital status, sex, effectional or sexual orientation, discriminate against any person who is qualified and available to perform the work to which the employment relates;
- b. No CONTRACTOR, Subcontractor, nor any person on his behalf shall in any manner, discriminate against or intimidate any employee engaged in the performance of work under this contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, color, national origin, ancestry, marital status, sex, effectional or sexual orientation;
- c. There may be deducted from the amount payable to the CONTRACTOR by the contracting public agency, under this contract, a penalty of \$50.00 for each person for each calendar day during which such person is discriminated against or intimidate in violation of the provisions of the contract; and
- d. This Contract may be canceled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the contract occurring after notice to the CONTRACTOR from the contracting public agency of any prior violation of this section of the contract.

19.03 *Foreign Corporations (NJSA 14A:13-3)*

1. No foreign corporation shall have the right to transact business in this State until it shall have procured a certificate of authority so to do from the Secretary of State. A foreign corporation may be authorized to do in this State any business which may be done lawfully in this State by a domestic corporation, to the extent that it is authorized to do such business if the jurisdiction of its incorporation, but no other business.
2. Without excluding other activities which may not constitute transacting business in this State, a foreign corporation shall not be considered to be transacting business in this State, for the purposes of this act, by reason of carrying on in this State any one or more of the following activities;
 - a. maintaining, defining or otherwise participating in any action or proceeding, whether judicial, administrative, arbitative or otherwise, or effecting the settlement thereof or the settlement of claims or disputes;
 - b. holding meetings of its directors or shareholders;
 - c. maintaining bank accounts or borrowing money, with or without security, even if such borrowings are repeated and continuous transactions and even if such security has a situs in this State;
 - d. maintaining offices or agencies for the transfer, exchange and registration of its securities, or appointing and maintaining trustees or depositories with relation to its securities.
3. The specification in subsection 14A: 13-3(2) does not establish a standard for activities which may subject a foreign corporation to service of process or taxation in this State.

19.04 *Statement of Ownership (NJSA 52:25-24.2)*

No corporation or partnership shall be awarded any contract nor shall any agreement be entered into for the performance of any work or the furnishing of any materials or supplies, the cost of which is to be paid with or out of any public funds, by the State, or any county, municipality or school district, or any subsidiary or agency of the State, or of any county, municipality or school district, or by any authority, board, or commission which exercises governmental functions, unless prior to the receipt of the bid or accompanying the bid, of said corporation or said partnership, there is submitted a statement setting forth the names and addresses of all stockholders in the corporation or partnership who own 10% or more of its stock, of any class or of all individual partners in the partnership who own a 10 % or greater interest therein, as the case may be. If one or more such stockholder or partner is itself a corporation or partnership, the stockholders holding 10% or more of that corporation's stock, or the individual partners owning 10% or greater interest in that partnership, as the case may be, shall also be listed. The disclosure shall be continued until all names and addresses of every non-corporate stockholder, and individual partner, exceeding the 10% ownership criteria established in this act, has been listed (see Section 00305).

19.05 *Use of Domestic Materials (NJSA 52:33-1 and 52:33-3)*

Notwithstanding any inconsistent provision of any law, and unless the head of the department, or other public officer charged with the duty by law, shall determine it to be inconsistent with the public interest, or the cost to be unreasonable, only domestic materials shall be acquired or used for any public work.

This section shall not apply with respect to domestic materials to be used for any public work, if domestic materials of the class or kind to be used are not mined, produced or manufactured, as the case may be, in the United States in commercial quantities and of a satisfactory quality.

Every contract for the construction, alteration, or repair of any public work in this state shall contain a provision that in the performance of the work the CONTRACTOR and all Subcontractors shall use only domestic material in the performance of the work; but if the head of the department or other public officer authorized by law to make the contract shall find that in respect to some particular domestic materials it is impracticable to make such requirement or that it would unreasonably increase the cost, an exception shall be noted in the specifications as to that particular material, and a public record made of the findings which justified the exception.

19.06 *Prevailing Wage Rates (NJSA 34:11-56.25)*

The Contractor shall pay not less than the prevailing wage rate to workers employed in the performance of any contract for the project, in accordance with the rate determined by the Commissioner of New Jersey Department of Labor pursuant to N.J.S. A. 34:11-56.25 et seq. OR the United States Secretary of Labor pursuant to 29 CFR Part 5, whichever is greater. The Contractor shall refer to section 19.10 for the requirements of the Davis-Bacon Act.

In accordance with the New Jersey Prevailing Wage Act no worker shall be paid less than such prevailing rates (included in Contract Documents). In the event it is found that any CONTRACTOR covered by said contract paid a rate of wages less than the prevailing wage required to be paid, OWNER may terminate the CONTRACTOR's right to proceed with the contract, or such part of work as to which there has been a failure to pay required wages, and to prosecute the work to completion or otherwise. The CONTRACTOR and his sureties shall be liable to the OWNER for any excess cost occasioned thereby. Nothing in this act shall prohibit the payment of more than the prevailing rate to any worker employed on a public work.

The CONTRACTOR and Subcontractor shall post the prevailing wage rates for each craft and classification involved, as determined by the Commissioner of Labor, including the effective date of any changes thereof, in prominent and easily accessible places at the site of the work, or at such place or places as are used by them to pay workmen their wages.

The New Jersey Prevailing Wage Act, NJSA 34:11-56.25 et seq. requires that all public works employers shall submit a certified payroll record to the public body or lessor which contracted for the public work project each payroll period within ten (10) days of the payment of wages. The public body shall receive, file and make available for inspection during normal business hours the certified payroll records.

Attention is directed to the Prevailing Wage Rate List and to the applicable provision of "The New Jersey Prevailing Wage Act" N.J.S.A. 34:11-56.25 et. Seq., governs the prevailing wage rates of wagers for workmen who are employed on this Project. The provisions of said Wage Act and Amendment thereto, shall be considered as part of this Contract and made part hereof.

The Bidder by submitting the Proposal represents to the OWNER that bidder is aware of the provision of said Wage Act with relation to prevailing rates of wages for workmen to be employed on this Project.

The Bidder further represents that in the event of any re-determination of such prevailing rates at any time before the execution and delivery of the Contract between the Bidder and the OWNER for the work of construction of the Project, or at any time thereafter, the new rates, if any, will become the applicable minimum rates for work performed thereafter under said Contract. No increase in the contract price will be claimed by the Bidder and no such increase in the contract price will be claimed by the Bidder and no such increase will be granted by the OWNER as a result of such determination.

Prospective bidders are advised to contact the New Jersey Department of Labor and Industry with respect to questions relating to the Wage Rate Determination.

19.07 *State Treasurer's List of Debarred, Suspended and Disqualified Bidders (NJSA 34:11)*

The CONTRACTOR, or an officer or partner of the bidder shall not, at the time of the bid, be included on the State Treasurer's List of debarred, suspended, or disqualified bidders. The CONTRACTOR shall immediately notify the OWNER whenever it appears that the CONTRACTOR is on the State Treasurer's List. The CONTRACTOR may be debarred, suspended, or disqualified from contracting with the State and the Department if the CONTRACTOR commits any of the acts listed in NJAC 7:1-5.2. Enclosed with the State Wage Rate Determination is a list of contractors and subcontractors who are debarred from public works pursuant to NJSA 34:11-56.37 and 38, no contract will be awarded or made to the listed CONTRACTOR's or subcontractors.

19.08 *Small Business Concerns Owned and Controlled by Socially and Economically Disadvantaged Individuals (SEDs) (NJAC 7:22-9)*

It is the policy of the PVSC to promote award of contracts to Socially and Economically Disadvantaged (SED) small business enterprises by stipulating specific requirements for involving such businesses in contracting. The failure of the Contractor to demonstrate a good faith effort to achieve the goals set forth herein by utilizing best efforts to implement the SED utilization plan will constitute an event of default of the Agreement. PVSC shall designate a compliance officer who shall be responsible for coordinating SED utilization efforts for the Agreement and for monitoring compliance with the plan. PVSC reserves the right to audit the Contractor's SED records to insure compliance with this provision. Socially and economically disadvantaged businesses definitions and associated terms are defined in the NJAC 7:22-9.2.

The CONTRACTOR is advised that not less than ten (10) percent of the total amount of all contracts for building, materials or services for the project shall be awarded to small business concerns owned and controlled by socially and economically disadvantaged individuals as defined in Section 637 (a) and 637 (d) of the Small Business Act (15USC, 637 (a) and 637 (d)), and any regulations promulgated thereto.

When soliciting services from subcontractors, the Contractor must include the 10% goal in its Proposals. Contract work cannot commence until the PVSC has approved the Contractor's SED Utilization Plan.

The CONTRACTOR's Plan to meet SED Utilization Requirements shall be submitted by the successful bidder within 30 days of Contract award to the PVSC. To be approvable, the SED Utilization Plan for subcontractors, suppliers and construction, must detail the steps taken or to be taken by the CONTRACTOR to provide for SED utilization for the total fair share percentage established by the Agreement. It must further provide adequate documentation to evidence the CONTRACTOR's efforts to date and planned efforts toward achieving the goal over the duration of the project.

Additional guidance on implementation of SED Requirements is included under NJAC 7:22-9 et seq. as given in the attached. Copies of Form OEO-002, SED Participation Building Phase Quarterly Reporting Form for Contracting Agencies and Contractors; and Form OEO-003, SED Participation Monthly Progress Report are included for CONTRACTOR's use. The CONTRACTOR shall comply with all requirements imposed by the OWNER in order to fulfill the SED Utilization Requirements, as further clarified in PVSC's SED Utilization Plan as given in the attached. (See exhibits 5 through 8 for the aforementioned documents).

19.09 Termination of Loans

Termination of loans by the Department shall be conducted as follows:

1. The Department may terminate a Fund loan in whole or in part for good cause. The term "good cause" shall include but not be limited to:
 - i. Substantial failure to comply with the terms and conditions of the Fund loan agreement;
 - ii. Default by the recipient;
 - iii. A determination that the Fund loan was obtained by fraud;
 - iv. Without good cause therefor, substantial performance of this project work has not occurred;
 - v. Gross abuse or corrupt practices in the administration of the project have occurred; or
 - vi. Fund moneys have been used for non-allowable costs.
2. The Department shall give written notice to the recipient (certified mail, return receipt requested) of its intent to terminate a Fund loan, in whole or in part, at least 30 days prior to the intended date of termination.
3. The Department shall afford the recipient an opportunity for consultation prior to any termination. After such opportunity for consultation, the Department may, in writing (certified mail, return receipt requested), terminate the Fund loan in whole or in part.

- (b) Project termination by the recipient shall be subject to the following:
1. A recipient shall not unilaterally terminate the project work for which a Fund loan has been awarded, except for good cause and subject to negotiations and payment of appropriate termination settlement costs. The recipient shall promptly give written notice to the Department of any complete or partial termination of the project work by the recipient.
 2. If the Department determines that there is good cause for the termination of all or any portion of a project for which the Fund loan has been awarded, the Department may enter into a termination agreement or unilaterally terminate the Fund loan effective with the date of cessation of the project work by the recipient. The determination to terminate the Fund loan shall be solely within the discretion of the Department. If the Department determines not to terminate, the recipient shall remain bound by the terms and conditions of the Fund loan agreement.
 3. If the Department determines that a recipient has ceased work on a project without good cause, the Department may unilaterally terminate the Fund loan pursuant to this section.
- (c) The Department and recipient may enter into a mutual agreement to terminate at any time pursuant to terms which are consistent with this subchapter. The agreement shall establish the effective date of termination of the project and the schedule for repayment of the Fund loan.
- (d) Upon termination, the recipient may be required to immediately refund or repay to the State the entire amount of the Fund loan moneys received. If the loan is guaranteed by a security/deficiency agreement may have to be brought into effect to ensure the entire repayment of the Fund loan. The Department may, at its discretion, authorize the immediate repayment of a specific portion of the Fund loan and allow the remaining balance to be repaid in accordance with a revised Fund loan repayment schedule.
- (e) The recipient shall reduce the amount of outstanding commitments insofar as possible and report to the Department the uncommitted balance of Fund moneys awarded under the Fund loan. The recipient shall make no new commitments without the Department's specific approval thereof. The Department shall make the final determination of the allowability of termination costs.
- (f) In addition to any termination action, the Department retains the right to pursue other legal remedies as may be available under federal, State and local law as warranted.

19.10 Davis Bacon Act

The CONTRACTOR shall comply with the requirements of the Davis Bacon Act as given in the attached Exhibit 3.

19.11 *Construction of Wastewater Treatment Facilities (NJAC 7:14-2)*

Chapter 7:14 of NJAC shall have precedence over other potentially contradictory language elsewhere in the contract documents. A copy of Chapter 14 is available from the State of New Jersey and is available for review at the offices of the Passaic Valley Sewerage Commission.

19.12 *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..

EXHIBIT NO. 1

PREVAILING WAGE RATES

A copy of the Essex County, State and Federal Wage Rates are included in this Exhibit.

The CONTRACTOR is reminded that it is responsible to utilize the current and applicable rates for the work being performed.

THE PARTICULAR PREVAILING WAGE SCHEDULES
INCLUDED IN THIS CONTRACT ARE NOT REPRINTED HERE
DUE TO SIZE.

EXHIBIT NO. 2

LIST OF DEBARRED CONTRACTORS AND SUBCONTRACTORS



State of New Jersey

DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT
PO BOX 389
TRENTON, NEW JERSEY 08625-0389

May 6, 2016

LISTED CONTRACTORS AND SUBCONTRACTORS

PURSUANT TO N.J.S.A 34:11-56.37 AND 34:11-56.38 OF THE PREVAILING WAGE ACT

NO PUBLIC WORKS CONTRACT MAY BE AWARDED TO ANY OF THE FOLLOWING CONTRACTORS AND SUBCONTRACTORS OR TO ANY FIRM, CORPORATION OR PARTNERSHIP IN WHICH THEY HAVE AN INTEREST UNTIL THE EXPIRATION DATE GIVEN.

<u>CONTRACTORS AND SUBCONTRACTORS</u>	<u>ADDRESS</u>	<u>EXPIRATION DATE</u>
360 Golf, LLC Michael Lenec, Partner Devin Lemere, Partner	300 Mamaroneck Avenue, #733, White Plains, NY 10605 300 Mamaroneck Ave, White Plains, NJ 10605 300 Mamaroneck Ave, # 133, White Plains, NY 10605	06/29/2018
4 S Logging & Lumber Co., Inc. George Heigel, Vice-President Carole Johnson, Secretary Shawn Sheeley, President	130 Sheeley Road Ext., Kersey, PA 15846 350 Main Street, Kersey, PA 15846 390 Seneca Road, St marys, PA 15857 130 Sheeley Road, Kersey, PA 15846	05/29/2016
A & H Contracting, Inc.	33 Eastwood Blvd., Manalapan, NJ 07726	05/27/2017
A.J. Skora Inc. Andrzej Skora, President	1982 Route 9, Toms River, NJ 08753 67 Cox Cro Road, Toms River, NJ 08755	08/18/2016
A.V. Construction, Inc. Michael Verduci, President	12 Verduci Dr., Newtown, PA 18940 12 Verduci Drive, Newtown, PA 18940	05/25/2018
AB Contracting & Development LLC Michael Santos, President	191 Central Ave, 2nd Floor, Newark, NJ 07101 988 Johnson Place, Apt. 4, Union, NJ 07083	11/26/2016
ACC Contractors Corp. Robert Lueders, Owner	105 11th Street, Hoboken, NJ 07030 1008 Ridge Drive, Union, NJ 07083	05/21/2016
Advantage Contracting & Entertainment Services Inc John H. Madara, President	319 Terrace Street, Rahway, NJ 07065 319 Terrace St, Rahway, NJ 07065	05/07/2018
Advantage Sport USA, Inc. Maurice Guariglia, Owner / Officer	1 Tigan Street, Winooski, VT 05404 494 North Barbor Road, Colchester, VT 05446	01/19/2019
All County Pipeline & Site Excavation Inc. Christine Charles, Vice-President Eric Charles, President	164 Ball Ave, Parsippany, NJ 07054 396 Cherry Ln, Mendham, NJ 07945 396 Cherry Ln, Mendham, NJ 07945	04/21/2017
Allied Construction LLC. Allied Construction Management, LLC Alfred Sciubba, Managing Member	100 Dobbs Lane, Suite 102, Cherry Hill, NJ 08034 3 Chadwick Drive, Voorhees Twp., NJ 08043	10/21/2016

CONTRACTORS AND SUBCONTRACTORS**ADDRESS****EXPIRATION DATE**

AMC Industries LLC same Denise Mautone, Member Anna Mautone, Member Lisa Mautone, Member	P.O. Box-760, Holmdel, NJ 07733 18A South Bears Street, Holmdel, NJ 07733 88 Stilwell Road, Holmdel, NJ 07733 25 Roberts Road, Holmdel, NJ 07733	08/04/2016
American Eagle Contractor, Inc. Agustin Zuniga, President	420 Broadway, Long Branch, NJ 07740 420 Broadway, Long Branch, NJ 07740	08/11/2017
American Welding Services American Welding Services, Inc. Brian O'Shea, Owner	1041 Glassboro Rd D-2, Williamstown, NJ 08094 1041 Glassboro Rd. D-2, Williamstown, NJ 08094	07/09/2017
Antiveros Construction, Inc. Donnie Antiveros, President Olga Conteras, Vice-President	677 Old Highway 64, Etowah, NC 28729 677 Old Highway 64, Etowah, NC 28729 677 Old Highway 64, Etowah, NC 28729	10/19/2018
Apex Tower Services, Inc. Richard Pluese, Vice-President	245 Sharp Road, Marlton, NJ 08053 66 E Cedar Avenue, Marlton, NJ 08053	02/09/2019
Area Fuel Paul Grillo, Owner Paul Grillo, Owner	207 Butler Ave, Staten Island, NY 10307 207 Bulter Ave, St. Island, NY 207 Butlerr Ave, Staten Island, NY 10307	02/17/2018
Arete Development Inc. Arete Development Inc. Justin Ettore, Vice-President John Ettore, Owner Matthew Ettore, Vice-President Jonathan Ettore, President	20 Industrial Road, Fairfield, NJ 07004 52 Brass Castle Road, Washington, NJ 07882 1453 Tooz Place, South Plainfield, NJ 07080 8 Brookside Drive, Warren, NJ 07059 7 Craig Road, Readington, NJ 08853	01/04/2019
Arteo Contracting & Development Arteo Contracting & Development, Inc. Peter Santos, President	35 Elmwood Ave, Unit 2B, Union, NJ 07083 35 Elmwood Ave, Unit 2B, Union, NJ 07083	08/26/2016
B & B Atlantic LLC Florian Dobre, Partner	526 Sheridan Ave., Roselle, NJ 07203 526 Sheridan Ave, Roselle, NJ 07203	12/01/2016
Barzzini Construction John Sorrentino, Owner	65 Fern St, Browns Mills, NJ 08015 65 Fern St, Browns Mills, NJ 08015	09/15/2017
BCA Trucking LLC BCA Trucking, LLC David Bastos, Managing Member	10 Pleasant Place, Kearny, NJ 07032 P.O. Box 5806, Newark, NJ 07105 10 Pleasant Place, Kearny, NJ 07032	08/04/2016 08/04/2016
Beckett Enterprises, Inc. Wesley J. Beckett Jr., President	P.O. Box 334, Malaga, NJ 08328 110 Oak Avenue, Malaga, NJ 08328	01/05/2017
Blue Skies Electric L.L.C. Scott Frasca, Manager Rachel Frasca, Owner	326 Coles Mill Road, Williamstown, NJ 08094 326 Coles Mill Road, Williamstown, NJ 08094 326 Coles Mill Road, Williamstown, NJ 08094	01/06/2017
Brian Patterson Mechanical Contracting, Inc. Brian Patterson, President	5 Cindy Lane, Ocean, NJ 07712 11 Arlene Drive, West Long Branch, NJ 07764	03/29/2018
Brothers Landscaping J.H. Brothers Inc. Brad J. Moini, President	169 Robertsville Rd., Freehold, NJ 07728 101 Buttonwood Lane, Freehold, NJ 07728	01/05/2018
C & E Contracting, Inc. Donald Fleming, President	PO Box 690, Boonton, NJ 07005 340 Reservoir Road, Boonton, NJ 07005	12/15/2018
Calvin's Floor Service, aka Calvin's Carpet Service Calvin Hudson, Owner	126 Winding Ridge Road, Dover, DE 19904 126 Winding Ridge Road, Dover, DE 19904	06/11/2016

CONTRACTORS AND SUBCONTRACTORS**ADDRESS****EXPIRATION DATE**

Camelot Roofing, LLC	1455 St. George Ave., Roselle, NJ 07203	02/17/2018
Juan J. Barquero, Owner	533 South 5th Street, Elizabeth, NJ 07206	
Gaslo Drywall Corp.	644 East 2nd St, Unit 2, Plainfield, NJ 07060	04/22/2017
Luis Oliveras, Owner	644 East 2nd St., Plainfield, NJ 07060	
Centurion Companies Inc.	795 Susquehanna Avenue, Franklin Lakes, NJ 07417	07/24/2016
Glen P. Poppe, Secretary	795 Susquehanna Ave, Franklin Lakes, NJ 07417	
Christopher Poppe, President	317 Greenridge Road, Franklin Lakes, NJ 07417	
Chalmers Construction LLC.	435 Minnisink Road, Totowa, NJ 07512	11/20/2016
Shawn Chalmers, Owner	337 Crown Street, Brooklyn, NY 11211	
Keith Mishoe, Owner	341 Seaton Avenue, Roselle Park, NJ 07204	
Chanez Landscaping, LLC	PO Box 5646, New Brunswick, NJ 08903	09/23/2017
Noe Chanez, Principal	55 Miller Ave., Somerset, NJ 08873	
Cityline Contracting Inc.	556 Humboldt Street, Brooklyn, NY 11222	08/03/2017
Dorothy Dobiecka, President	556 Humboldt Street, Brooklyn, NY 11222	
Andrzej Citak, Vice-President	556 Humboldt St, Brooklyn, NY 11222	
CJC Builders Corp.	220 Mount Pleasant Ave., Newark, NJ 07104	01/07/2019
Curillo Guaman, Owner	197 Broad Street, Newark, NJ 07104	
Cobra Communications & Installations, LLC	26 Spencer Place, Garfield, NJ 07026	12/10/2017
Giovanny Bustos, Owner	26 Spencer Place, Garfield, NJ 07026	
Conex Construction Corp.	265 Wilson Avenue, Kearny, NJ 07032	01/19/2019
Armando Piedade, President	265 Wilson Avenue, Kearny, NJ 07032	
Coons Construction, LLC	23178 Summer View Circle, Three Springs, PA 17264	04/06/2018
William Coons, Owner	23178 Summer View Circle, Three Springs, PA 17264	
Coplen Management, Inc.	828 Highland Ave, Paramus, NJ 07652	06/25/2016
Mahesh Patel, Owner	828 Highland Ave, Paramus, NJ 07652	
CPS Mechanical Contractors, Inc.	203 Woods Ave, Bergenfield, NJ 07621	12/15/2017
Margaret Sherman, President	203 Woods Avenue, Bergenfield, NJ 07621	
CRC Concrete Raising of South Jersey, Inc.	110 South Harding Highway, Landisville, NJ 08326	02/01/2019
Theresa Frajdenberg, President	110 South Harding Highway, Landisville, NJ 08326	
CRC General Constructors Inc.	137 1/2 Washington Ave, Suite 290, Belleville, NJ 07109	08/11/2016
Antonio Gomes Jr., President	41 Hamilton Ave, Kearny, NJ 07032	
Crider Americas Solar LLC	6063 FM 535, Cedar Creek, TX 78612	05/11/2017
Steven Crider, Member	507 Pressler Street, Apt. 2128, Austin, TX 78703	
Harold Marshall, Jr., Member	1800 Eva Street, Austin, TX 78704	
Crossroad Construction Corp.	312 Emmet Street, Newark, NJ 07114	05/12/2016
Antonio Gomes Sr., President	164 Green Street, Newark, NJ 07105	
Cunhas Construction Inc.	35 Carmen Ct, Floor-1, Newark, NJ 07105	10/22/2017
Nuno Cunha, Owner	35 Carmen Ct., Newark, NJ 07105	
D & B Partners LLC	89 Jeanne Court, Stamford, CT 06905	08/08/2016
same		
Michael F. Ferro Jr., Member	89 Jeanne Court, Stamford, CT 06905	
John Giannattasio, Member	89 Jeanne Court, Stamford, CT 06905	
DeForest Demolition, Inc.	1508 Beaver Dam Road, Point Pleasant, NJ 08742	02/15/2019
Dane DeForest, President	2406 Herbertsville Road, Point Pleasant, NJ 08742	

CONTRACTORS AND SUBCONTRACTORS**ADDRESS****EXPIRATION DATE**

DG Construction & Renovations LLC Dean Gallo, Owner Harry Gallo, Secretary	245 Emanuel St., Trenton, NJ 08610 245 Emanuel Street, Trenton, NJ 08610 245 Emanuel Street, Trenton, NJ 08610	04/04/2019
Division Ten Installations, LLC Kevin G. Eib, President	29 Monmouth Road, Monroe Township, NJ 08831 29 Monmouth Road, Monroe Twp., NJ 08831	04/02/2017
DM Fernandes Contracts LLC Hugo Fernandes, Owner	551 North Broad St, Elizabeth, NJ 07208 90 Willow Street, Carteret, NJ 07008	01/27/2018
E & S Enterprises, LLC Helen Henriquez, Owner	P. O. Box 2050, Vineland, NJ 08360 101 South Orachard Road, Vineland, NJ 08360	01/27/2019
East Coast Touch Enterprises LLC Frank Loureier, Vice-President Nelson DeOliveira, President	152 Jackson St., Newark, NJ 07105 152 Jefferson St., Newark, NJ 07105 276 Highland Ave, Kearney, NJ 07032	08/11/2017
Eddy Drywall, LLC Eddy Rodriguez, Member	1100 W. 7th St., Apt. A9, Plainfield, NJ 07060 1100 W. 7th. St., Apt. A9, Plainfield, NJ 07063	05/13/2018
Elevator Medic Corporation Patrick Dellaquila, President	55 Brookview Drive, Woodcliff Lake, NJ 07677 55 Brookview Drive, Woodcliff Lake, NJ 07677	02/24/2017
Emanuel Drywall Services, Inc Cesar Garcia, Owner	64 Grandview Ave, North Plainfield, NJ 07060 64 Grandview Ave, North Plainfield, NJ 07060	04/30/2017
Envirocare Enterprises, Inc. Envirocare Enterprises, Inc. Uju A. Obiorah, President Inno Obiorah, Manager	358 Broadway, Suite 202, Newark, NJ 07104 259 West Forest Avenue, Englewood, NJ 07631 658 Rutgers Pl, Paramus, NJ 07652	05/15/2017
Estrada & Roca LLC Hector Estrada, Owner Jose Roca, Owner	468 9th Street, Palisades Park, NJ 07650 432 52nd Street Apt 2, West New York, NJ 07093 468 9th St, Apt # 2, Palisades Park, NJ 07650	05/30/2016
Euro Construction Ireneusz Waluk, Owner	70 Bordendown-Chesterfield, Rd., Chesterfield, NJ 08022 70 Bordentown-Chesterfield, Rd., Chesterfield, NJ 08515	02/24/2017
Everest Masonry Construction, Inc. Rafael Ramos, President	163 E Main Street, Suite 311, Little Falls, NJ 07424 120 Cantello Street, Union City, NJ 07087	11/08/2018
Everest Masonry Constructors, Inc. Mark Rodrigues, President	1 Orient Way, Suite 226, Rutherford, NJ 07070 523 Hamilton Avenue, Kingston, PA 18704	11/08/2018
Felipe Villagomez owner Felipe Villagomez, Owner	160 Lincoln Street, Bridgeton, NJ 08302 160 Lincoln Street, Bridgeton, NJ 08302	03/08/2019
Fittin Construction, LLC Sheree Severini-Fittin, Member Thomas Fittin, Owner / Officer	2243 Edgar Rd, Point Pleasant Beach, NJ 08742 2243 Edgar Rd., Point Pleasant Beach, NJ 08742 2243 Edgar Rd, Point Pleasant Beach, NJ 08742	02/23/2019
Five Star Quality Construction Alicirio Jose Santana Pires, Owner	141 Rte. 130 South, Suite 192, Cinnaminson, NJ 08077 141 RT. 130 South, Suite 192, Cinnaminson, NJ 08077	04/22/2017
Frank Montgomery Builder Frank Montgomery, Owner	42 Bryant Rd., Waretown, NJ 08758 42 Bryant Rd., Waretown, NJ 08758	07/10/2017
G.F.I. Siteworks, Inc. G.F.I. Siteworks, Inc. James DiLorenzo, Vice-President Salvatore A Casella III, President	P.O. Box 296, Clarksboro, NJ 08020 440 Mantua Avenue, Paulsboro, NJ 08066 362 Friendship Road, Clarksboro, NJ 08020	02/02/2019
Gale Force Telecommunications Inc	211 Jewett Road, Upper Nyack, NY 10960	12/01/2016

CONTRACTORS AND SUBCONTRACTORS**ADDRESS****EXPIRATION DATE**

Galindo Const. LLC Gabino Galindo, Owner	1025 23rd St, Paterson, NJ 07513 1025 23rd St, Paterson, NJ 07513	08/06/2018
Garza Contracting LLC John Garza, Owner	768 Chambers Street, Trenton, NJ 08619 768 Chambers St., Trenton, NJ 08611	04/27/2017
Grab Heating and Air Conditioning, LLC. Zbigniew Grabowski, Owner	35 Jersey Street, East Rutherford, NJ 07073 35 Jersey Street, East Rutherford, NJ 07073	05/14/2016
Green Diamond Roofing & Live Roof, LLC Jazmine Price, President	3515 Frankford Ave, Philadelphia, PA 19134 744 South St Unit 65, Philadelphia, PA 19147	08/04/2016
Griffin Sign, Inc. Michelle Angerame, President	464 North Randolph Avenue, Cinnaminson, NJ 08077 12 Pendleton Court, Medford, NJ 08055	03/13/2019
GSR Architectural, Inc. GSR Architectural, Inc. Gary Russo, President	200 Mountain Avenue, Middlesex, NJ 08846 3 Premier Way, Manalapan, NJ 07726	08/13/2016
GST Power Service Group Inc. Lauchland Roberts, President	2801 Remington Street, Suite #3, Fort Collins, CO 80525 2801 Remington Street, Suite 3, Fort Collins, CO 80526	05/03/2018
Heritage Hills Estates Frank Carpine, Owner	3730 S. Delsea Dr, Vineland, NJ 08360 100 Liberty Dr, Millville, NJ 08332	01/03/2019
HFC Painting Hugo Canabe, CEO	696 Elm Street, Kearny, NJ 07032 696 Elm St, Kearny, NJ 07032	03/17/2018
HFM Labor Ready LLC HFM Labor Ready LLC Keith Ludwig, Member	459 Rt 38 West, Maple Shade, NJ 08052 459 Rt 38 West, Maple Shade, NJ 08052	01/05/2018
Highway Safety Systems Inc. William J. Doyle, President	200 Pine Road, Hammonton, NJ 08037 200 Pine Rd., Hammonton, NJ 08037	12/16/2017
I.K.E. Electrical Corp. Rebecca Adika, Secretary Angelo Castelli, President Yitzhak Adika, Vice-President	100 W. Forest Avenue, Building E, Englewood, NJ 07631 76 Alpine Dr., Closter, NJ 48 E. Central Blvd., Palisades Park, NJ 07650 76 Alpine Drive, Closter, NJ 07624	07/20/2017
IBS, Inc. Christopher Rymal, Owner	1929 Darby Road, Havertown, PA 19083 1929 Darby Rd., Havertown, PA 19083	05/15/2017
Ideal Elevator Services Patrick Dell'Aquila Patrick Dell'Aquila, President	55 Brookview Dr., Woodcliff Lake, NJ 07677 55 Brookview Drive, Woodcliff Lake, NJ 07677	02/24/2017
Industrial Concrete Const. of NJ, Inc. Lori A. Frisina, President	P.O. Box 9349, Lyndhurst, NJ 07071 235 Grand Avenue, Rutherford, NJ 07070	06/26/2016
Interstate Home Service Inc. Interstate Home Service Inc. Maurice Rolando, Owner	165 Heights Avenue, Fair Lawn, NJ 07410 165 Height's Ave., Fair Lawn, NJ 07410	08/16/2018
J & B Plumbing LLC Joseph Battista, Owner	644 Cross Street, Lakewood, NJ 08701 11 Hummingbird Way, Jackson, NJ 08527	05/03/2018
J G Roofing, LLC Manuel Chaguan, Owner	85 Prospect Ave. Apt.1, Irvington, NJ 07111 85 Prospect Ave., Irvington, NJ 07111	04/25/2019
J&D Plumbing & Heating Inc. John J. Benedetti Jr., President	193 Natrona Avenue, Mercerville, NJ 08619 193 Natrona Avenue, Mercerville, NJ 08619	11/01/2018
J.C. Maintenance & Repair Emanuel Cucco, Owner	6725 13th Avenue, Brooklyn, NY 11219 1435 71st Street, Brooklyn, NY 11228	03/14/2019

CONTRACTORS AND SUBCONTRACTORS**ADDRESS****EXPIRATION DATE**

J.D.S Electric, Inc. Joe DeSalvo, Jr., Owner	149 Montross Ave., Rutherford, NJ 07070 149 Montross Ave., Rutherford, NJ 07070	01/06/2018
Jack Mack Commercial Roofing, Inc. Gregorio Soto, Owner	768 Courtlandt St., Perth Amboy, NJ 08861 153 Lewis Street, Perth Amboy, NJ 08861	03/17/2018
Jamali Developers, LLC SUSPENDED PENDING DEBARMENT Hussain Burhanpurwala, Member	238 Fresh Ponds Road, Suite 100, Monroe, NJ 08816 553 Marc Drive, North Brunswick, NJ 08902	SUSPENDED
Jamcon Construction LLC John Schiavo, Managing Member	100 Springdale Road, Cherry Hill, NJ 08003 6 Justa Lane, Cherry Hill, NJ 08003	01/12/2017
JC Builders James Chaney, President	610 County Meadows Rd., Nicholls, GA 31554 610 County Meadows Rd., Nicholls, GA 31554	08/10/2018
JD Scaffold Inc. Randy Garciga, Owner	13353 NE 17th Ave, North Miami, FL 33181 13353 NE 17th Avenue, North Miami, FL 33181	08/24/2017
Joseph Csakvary, Inc. Joseph Csakvary, President	163 Breakneck Road, Highland Lakes, NJ 07422 163 Breakneck Road, Highland Lakes, NJ 07422	11/03/2016
JTG Scaffolding & Hoisting LLC Randy Garciga, Owner	309 West Elizabeth Avenue, Linden, NJ 07036 13353 NE 17th Avenue, Miami, FL 33181	10/22/2017
K & J Drywall Contractor, Inc. Jonny Ayala, Owner	705 Taft Avenue, North Plainfield, NJ 07063 68 Westervelt Avenue, Plainfield, NJ 07060	03/16/2019
K & S Fabrication & Welding, LLC Simon Walcott, Owner	23 North Street, Bergenfield, NJ 07621 43 Fairview Avenue, Bergenfield, NJ 07621	01/12/2018
K&K Construction LLC Ki Kuk Kim, Partner Kwang Hee Kim, Partner	685 Bergen Blvd., Ridgefield, NJ 07657 685 Bergen Blvd., Ridgefield, NJ 07657 685 Bergen Blvd., Ridgefield, NJ 07657	06/09/2017
Kitchen Crafters Plus d/b/a B&B Custom Cabinets Albert Brisebois, Owner	1 Suydam Place, Aberdeen, NJ 07747 1 Suydam Place, Aberdeen, NJ 07747	05/31/2018
KS Exteriors, LLC KS Exteriors, LLC Kris Brezinska, Owner	650 Ohio Ave., Trenton, NJ 08638 650 Ohio Ave., Trenton, NJ 08638	03/08/2019
L and Y Roofing, LLC Luis Vargas, Owner	183 Belmont Avenue, Haledon, NJ 07522 291 Jefferson Street, Paterson, NJ 07522	03/16/2017
Lombardi Enterprises, Inc. Alan Lombardi, President Ann Lombardi, Secretary	2901 South Clinton Avenue, South Plainfield, NJ 07080 26 Whispering Way, Berkeley Hights., NJ 07922 26 Whispeiring Way, Berkeleyly Hights, NJ 07922	12/09/2017
Low Bid, Inc. SUSPENDED PENDING DEBARMENT George McNulty, President	125 East Broadway, Long Beach, NY 11561 125 East Broadway, Suite 507, Long Beach, NY 11561	SUSPENDED
M.E. Group, LLC Segundo E. Llivicota, Member Manuel Quito, Member	164 Polk St., Apt. 1, Newark, NJ 07105 164 Polk Street, Apt. #1, Newark, NJ 07105 164 Polk Street, Apt. 1, Newark, NJ 07105	06/29/2018
Marvin Ardon Painting Marvin Alexander Ardon, Owner	52 S. Jefferson St., Orange, NJ 07070 52 South Jefferson St., Orange, NJ 07050	12/03/2016
Mattina Construction LLC Vincent Mattina, Owner	22 Toms River Road, Jackson, NJ 08527 22 Toms River Rd, Jackson, NJ 08527	12/14/2017
Metal Fab Atlantic LLC John Dever, Owner	353 Zion Road, Egg Harbor Township, NJ 08234 1086 Mays Landing Road, Somers Point, NJ 08234	01/21/2018

CONTRACTORS AND SUBCONTRACTORS**ADDRESS****EXPIRATION DATE**

Metroplex Products Co. Inc. Peter Herring, President	377 Deans Rhode Hall Road, Monroe, NJ 08831 164 South Moetz Drive, Milltown, NJ 08850	01/06/2018
Metropolitan Stone & Tile, LLC Margaret Farina, Owner	102 Richards Ave, Dover, NJ 07801 30 Monsignor Deluca Plaza, Nutley, NJ 07110	09/23/2018
MF Speed Construction, LLC. Magda Zamprogno, Other Fernando Lopes, President	65-67 7th Ave. East, 1st Floor, Newark, NJ 07104 65-67 7th Ave., East 1st Floor, Newark, NJ 07104 65-67 7th Ave., East 1st Floor, Newark, NJ 07104	10/16/2016
MG Topflight Ashish Thomas, Owner	6 Spruce Meadows Dr., Monroe, NJ 08831 6 Spruce Meadows Dr., Monroe, NJ 08831	07/28/2017
Midwest Construction, Inc. George Antonas, President	114 Brace Road, Cherry Hill, NJ 08034 114 Brace Road, Cherry Hill, NJ 08034	07/23/2017
Mullen & Sons Contractors, Inc. John Mullen, Sr, President John Mullen, Jr., Owner	PO Box 773, West Caldwell, NJ 07006 45 Fairfield Place, West Caldwell, NJ 07006 45 Fairfield Place, West Caldwell, NJ 07006	02/28/2019
Natural View Landscapes LLC Zachary Kouhoup, President	513 West Summer Ave, Minotola, NJ 08341 5923 Peach St, Mays Landing, NJ 08330	01/05/2017
NDA & Construction, LLC Nester Torres, Owner	161 Thomas St, Unit 1, Newark, NJ 07114 161 Thomas St, Unit 1, Newark, NJ 07114	12/10/2017
New Jersey State Flooring, Inc. Roy C. Apgar, President Cheryl Apgar, Vice-President	109 Greentree Road, Brick, NJ 08724 109 Greentree Road, Brick, NJ 08724 109 Greentree Road, Brick, NJ 08724	02/10/2019
Niceta Electric Joseph Niceta, Owner	2119 Merritt Drive, Northfield, NJ 08225 2119 Merritt Drive, Northfield, NJ 08225	10/19/2018
Nicola Matera & Sons L.L.C. William Vlasich, Managing Member Sheila Vlasich, Managing Member	48 Old Jacksonville Road, Towaco, NJ 07082 7 Ginkgo Court, Upper Saddle River, NJ 07458 7 Ginkgo Court, Upper Saddle River, NJ 07458	10/20/2016
Noe's Concrete Inc Noe Alatorre, Owner	30 Euclid Ave, Medford, NY 11753 30 Euclid Ave, Medford, NY 11763	06/06/2016
NT&P Construction Inc. Nicola Pengue, President	105 White Oak Lane, Old Bridge, NJ 08857 4 Camelot Avenue, Monroe Township, NJ 08831	11/22/2018
Ocean Blue Builders LLC John Riley Jr, Managing Member	711 Carol Avenue, Oakhurst, NJ 07755 140 Harrison Avenue, Fair Haven, NJ 07704	11/05/2017
OCM Construction OCM Construction, LLC William Mitchell, Owner	203 Main Street, #204, Flemington, NJ 08822 22 Greenwood Place, Flemington, NJ 08822	08/11/2017
Octagon Construction Octagon Construction Wojciech Puchajda, Owner	10 Jeanette Street, Carteret, NJ 07008 10 Jeanette St., Carteret, NJ 07008	03/02/2018
Ohana Metal & Iron Works Inc. Erezy Ohana, Owner	60 Miller Road, Montgomery, NY 12549 60 Miller Road, Montgomery, NY 12549	08/05/2017
Old City Remodeling Fabricio Franco, Owner	1406 Lexington Pl., Elizabeth, NJ 07208 1406 Lexington Pl., Elizabeth, NJ 07208	06/09/2016
Old World Construction, Inc. Krzysztof Oprzadek, President Stanislaw Dziuba, Vice-President	P.O Box 35, Pennington, NJ 08534 19 Woodville Rd, Hopewell, NJ 08525 69 West Shore Drive, Pennington, NJ 08534	02/10/2018

CONTRACTORS AND SUBCONTRACTORS**ADDRESS****EXPIRATION DATE**

Paul F. Roscitt Electric, Inc. Paul F Roscitt, President	262 Harmon Avenue, Fort Lee, NJ 07024 262 Harmon Avenue, Fort Lee, NJ 07024	11/08/2018
Paul Sexton Paul Sexton, Owner	462 10th Ave., Paterson, NJ 07510 462 10th Ave., Paterson, NJ	07/10/2017
Pax Construction Corp. Antonio Pereira, President Julio Pereira, Vice-President	67 Highway 36, West Long Branch, NJ 07764 159 Locust Avenue, West Long Branch, NJ 07764 304 Crimson Circle, Oakhurst, NJ 07755	10/16/2017
PER Construction LLC Manuel Pereira, Owner	67 State Route 36, Suite #4, West Long Branch, NJ 07764 194 Monmouth Ave., Long Branch, NJ 07740	10/16/2017
Perfection Erectors, LLC Perfection Erectors, LLC Marianne Cammarata, Manager Vincent Frank Cammarata, Owner	349 West Prospect Avenue, Keyport, NJ 07735 349 W. Prospect Ave., Keyport, NJ 07735 349 W. Prospect Avenue, Keyport, NJ 07735	02/23/2019
Perrone Trucking LLC James Perrone, Owner	74 Glen Roy Road East, Fairfield, NJ 07004 74 Glenroy Road East, Fairfield, NJ 07004	10/27/2018
Peter Vincent Peter Vincent, Owner	129 Highland Ave, Jersey City, NJ 07306 129 Highland Ave, Jersey City, NJ 07306	04/26/2018
Petric & Associates, Inc. Ellen Petric, President Steven Petric, Vice-President	1162 Greenpond Road, Newfoundland, NJ 07435 1162 Greenpond Road, Newfoundland, NJ 07435 1162 Greenpond Road, Newfoundland, NJ 07435	06/07/2018
Precise Builders LLC John Domingues, Owner	402 Market St, Newark, NJ 07105 402 Market St, Newark, NJ 07105	05/27/2017
R & B Construction Roxanne Lloyd, President	2008 Carmel Road, Millville, NJ 08332 2008 Carmel Road, Millville, NJ 08332	06/10/2018
Ranco Mechanical, Inc. Kenneth Davis, President Anthony Davis, Vice-President	P. O. Box 510, Augusta, NJ 07860 2 Melba Drive, Newton, NJ 07860 363 Northfield Avenue, Livingston, NJ 07039	10/28/2016
Raymond Mozak Plumbing & Heating Raymond G. Mozak, Owner	1423 Teresa Drive, Fort Lee, NJ 07024 1423 Teresa Drive, Fort Lee, NJ 07024	09/03/2016
Real Construction LLC Arkadiusz Chwedczuk, Owner	1984 Whitesville Rd, Toms River, NJ 08757 716 11th Avenue, Toms River, NJ 08757	11/23/2017
Ren Construction Albert Chwedczuk, Owner	1984 Whitesville Road, Toms River, NJ 08755 1984 Whitesville Road, Toms River, NJ 087055	07/09/2017
Resco, LLC Hallmark Electric, LLC David Peckham, Owner	P.O. Box 806, Old Saybrook, CT 06475 15 Elm Street, Old Saybrook, CT 06475	10/21/2018
Retail Store Painting John Thomas, President	202 Karen Drive, Scranton, PA 18505 202 Karen Drive, Scranton, PA 18505	01/12/2018
Riano Brothers, LLC. Atanasia Lazo Gutierrez Luis Riano, President	13 Poppy Ave., Neptune, NJ 07753 13 Poppy Ave., Neptune, 07753	02/25/2018
Ribles Locksmith & Hardware Evelyn McDermott, Owner	613 15th Ave., Belmar, NJ 07719 613 15th Ave, Belmar, NJ 07719	07/10/2017
Rizzo New York Inc. Rizzo New York Inc. Rizwan Ahmad, President	109-02 Jamaica Avenue, Richmond Hill, NY 11418 9157 97th St, Wood Haven, NY 11421	01/19/2019

CONTRACTORS AND SUBCONTRACTORS**ADDRESS****EXPIRATION DATE**

Robert M. Mesmer, LLC	24 Sand Bridge Rd., Elmer, NJ 08318	12/11/2017
Robert Mesmer, Managing Member	24 Sand Bridge Road, Elmer, NJ 08318	
Roncone Construction, L.L.C.	275 Chestnut St., Store B #113, Newark, NJ 07114	02/02/2018
Roncone Construction, L.L.C.		
Leonardo Marques Roncone, Managing Member	192 Emmet St., Newark, NJ 07105	
S & S Electric, LLC	108 Oak Glen Road, Toms River, NJ 08753	01/12/2018
Al Shan, President	108 Oak Glen Road, Toms River, NJ 08753	
Samco Construction Co. LLC	413-415 South Seventh St., Elizabeth, NJ 07202	07/02/2016
Anthony Mirabile, President	413-415 South Seventh St., Elizabeth, NJ 07202	
Sandora & Spina Contracting Inc.	15 North Branch River Rd., Branchburg, NJ 08876	06/28/2018
Edward Sandora, President	15 North Branch River Rd., Branchburg, NJ 08876	
Saravia Concrete Pumping Corp.	223-10, 113th St, Queens Village, NY 11429	08/18/2016
Jerson Saravia, Owner	223-10, 113th St, Queens Vaillage, NY 11429	
Shoreline Marine Construction, LLC	213 West Edgewood Ave, Linwood, NJ 08221	06/03/2016
Kenneth Pontari, Partner	213 West Edgewood Ave., Linwood, NJ 08221	
SP-One LLC	2816 Coronado Way, Vero Beach, FL 32960	07/21/2016
Lee Dinenberg, President	2816 Coronado Way, Vero Beacj, FL 32960	
Super Stars Construction Inc	58 Steiner Ave, Neptune City, NJ 07753	08/11/2017
Juan Riano, Owner	58 Steiner Ave., Neptune City, NJ 07753	
T. Fiore Demolition, Inc.	457 Wilson Avenue, Newark, NJ 07105	04/02/2017
same		
Theodore Fiore, Owner	9 Silver Spring Court, East Hanover, NJ 07936	
TAU Associates Plumbing & Mechanical LLC	91 Graham St., Jersey City, NJ 07307	12/17/2016
Lek Tauthong, Owner	91 Graham St, Jersey City, NJ 07307	
Team Equipment LLC	26 East Garden Place, Pompton Plains, NJ 07444	07/02/2016
William Morrissary		
William Morrissey, President	59 Lynwood Road, Cedar Grove, NJ 07009	
Terra-Tech Construction, Inc.	265 Woodward Rd, Suite A, Manalapan, NJ 07726	03/17/2018
Tania Gaga, Vice-President	121 Diamond Lane, Manalapan, NJ 07726	
Nicole Lucas, President	12 Red Fox Run, Manalapan, NJ 08857	
Testa Corp.	360 Audubon Road, Wakefield, MA 01880	05/27/2017
Steven D. Testa, Owner	6 North Hill Dr., Lynnfield, MA 01940	
The Boca Bay Group	16 South Avenue West, Suite 267, Cranford, NJ 07016	05/20/2016
Barbara Marano, President	163 Hillcreek Ave, Cranford, NJ 07016	
The Grace Brothers	311 Colonial Road, Edgewater Park, NJ 08010	01/08/2017
James T. Grace, Owner	14 Surrey Lane, Willingboro, NJ 08046	
Jethro Grace Jr., Owner	311 Colonial Road, Edgewater Park, NJ 08010	
Thomas Clark Fiberglass, LLC	145 Old Halfway Road, Barnegat, NJ 08005	10/22/2017
Thomas Clark, Owner / Officer	145 Old Halfway Rd., Barnegat, NJ 08005	
TJB Air Conditioning And Heating	2305 Garry Rd. Suite A, Cinnaminson, NJ 08077	02/28/2019
Timothy Babbitt, Owner	2305 Garry Rd. Suite A, Cinnaminson, NJ 08077	
TJD Construction	138 Stonehenge Dr, Toms River, NJ 08753	02/24/2017
Ted Dobrzanski		
Ted Dobrzanski, CEO	138 Stonehenge Dr, Toms River, NJ 08753	
Todd Cable Construction, LLC	151 Old State Rd., Newport, NY 13416	04/26/2018
Todd E. Warmingham, Owner	P.o. Box 215, Newport, NY 13416	

CONTRACTORS AND SUBCONTRACTORS**ADDRESS****EXPIRATION DATE**

Top Notch Tree & Landscape, LLC James Van Wyckhouse, Owner	70 East Allendale Rd., Saddle River, NJ 07458 46 Tam O Shanter Rd, Mahwah, NJ 07430	12/06/2018
TQM Construction Corporation Balwant DeVre, President	21 Pine Street, Suite 206, Rockaway, NJ 07866 21 Patriot Crossing, Rockaway, NJ 07866	03/22/2019
Trinity Paving, LLC Michele Doyle, Member	245 Clayton Road, Monroeville, NJ 08343-2652 115 Millstone Way, Monroeville, NJ 08343	10/20/2017
Tri-State Insulators, LLC Tracy Cavallaro, President	1038 Old York Rd., Raritan, NJ 08869 1038 Old York Road, Raritan, NJ 08869	07/17/2016
Turf Services Express LLC Sharleen Poppalardo, Managing Member	26 North Broad Street, Medford, NJ 08055 11 Muirfield Court, Medford, NJ 08055	03/26/2018
Turfscapes LLC Jeffrey Grize, Owner	PO Box 950, Williamstown, NJ 08094 3477 S. Blackhorse Pike, Williamstown, NJ 08094	05/27/2017
Twin Industries Jeanne Crispino, Vice-President	15 Lewis Street, Eatontown, NJ 07724 15 Lewis Street, Eatontown, NJ 07724	04/04/2019
Van Peenen Landscape Contractors, Inc. Van Peenen Landscape Contractors, Inc. Raymond Van Peenen, President	555 Preakness Avenue,, Suite 210, Totowa, NJ 07512 3 Gates Place, Wayne, NJ 07470	11/22/2018
Vercon Building & Maintenance Corp. Allanur Islambekov, Owner	11 Arboretum Drive, Jackson, NJ 08527 11 Arboretum Dr., Jackson, NJ 08527	05/11/2017
Victor Construction, Inc Tania Felix-Claudio, Owner	4615 N. Front St, 2nd Floor, Philadelphia, PA 19140 4615 N. front St., 2nd Floor, Philadelphia, PA 19140	04/22/2017
Wallmasters Modular Inc. Timothy Morrison, President	226 Mutual Avenue, Winchester, KY 40391 2745 SR668N, Junction City, OH 43748	07/28/2017
Warbeck Construction Group LLC Jon J Warbeck, President	63 Beaver Brook Road, Suite 305, Lincoln Park, NJ 07035 680 West Pine Brook Road, Lincoln Park, NJ 07035	02/28/2019
Wilder Drywall Wilder Drywall, Inc. Susan Wilder, President	101 Lookout Pass, Stormville, NY 12582 101 Lookout Pass, Stormville, NY 12582	08/04/2016

SUSPENDED PENDING DEBARMENT:**CONTRACTORS AND SUBCONTRACTORS****ADDRESS****SUSPEND DATE**

Jamali Developers, LLC Hussain Burhanpurwala, Member	238 Fresh Ponds Road, Monroe, NJ 08816 553 Marc Drive, North Brunswick, NJ 08902	01/11/2016
Low Bid, Inc. George McNulty, President	125 East Broadway, Long Beach, NY 11561 125 East Broadway, Long Beach, NY 11561	02/09/2016

LIST OF DEBARRED OWNERS/OFFICERS

5/6/2016

Owners/ Officers**Address****Company Name**

Yitzhak Adika, Vice-President	76 Alpine Drive, Closter, NJ 07624	I.K.E. Electrical Corp.
Rebecca Adika, Secretary	76 Alpine Dr., Closter, NJ	I.K.E. Electrical Corp.
Rizwan Ahmad, President	9157 97th St, Wood Haven, NY 11421	Rizzo New York Inc. Rizzo New York Inc.
Noe Alatorre, Owner	30 Euclid Ave, Medford, NY 11763	Noe's Concrete Inc
Michelle Angerame, President	12 Pendleton Court, Medford, NJ 08055	Griffin Sign, Inc.
Donnie Antiveros, President	677 Old Highway 64, Etowah, NC 28729	Antiveros Construction, Inc.
George Antonas, President	114 Brace Road, Cherry Hill, NJ 08034	Midwest Construction, Inc.
Roy C. Apgar, President	109 Greentree Road, Brick, NJ 08724	New Jersey State Flooring, Inc.
Cheryl Apgar, Vice-President	109 Greentree Road, Brick, NJ 08724	New Jersey State Flooring, Inc.
Marvin Alexander Ardon, Owner	52 South Jefferson St., Orange, NJ 07050	Marvin Ardon Painting
Jonny Ayala, Owner	68 Westervelt Avenue, Plainfield, NJ 07060	K & J Drywall Contractor, Inc.
Timothy Babbitt, Owner	2305 Garry Rd. Suite A, Cinnaminson, NJ 08077	TJB Air Conditioning And Heating
Juan J. Barquero, Owner	533 South 5th Street, Elizabeth, NJ 07206	Camelot Roofing, LLC
David Bastos, Managing Member	10 Pleasant Place, Kearny, NJ 07032	BCA Trucking, LLC
Joseph Battista, Owner	11 Hummingbird Way, Jackson, NJ 08527	J & B Plumbing LLC
Wesley J. Beckett Jr., President	110 Oak Avenue, Malaga, NJ 08328	Beckett Enterprises, Inc.
John J. Benedetti Jr., President	193 Natrona Avenue, Mercerville, NJ 08619	J&D Plumbing & Heating Inc.
Kris Brezinska, Owner	650 Ohio Ave., Trenton, NJ 08638	KS Exteriors, LLC KS Exteriors, LLC
Albert Brisebois, Owner	1 Suydam Place, Aberdeen, NJ 07747	Kitchen Crafters Plus d/b/a B&B Custom Cabi
Hussain Burhanpurwala, Member	553 Marc Drive, North Brunswick, NJ 08902	Jamali Developers, LLC SUSPENDED PENDING DEBARMENT
Giovanny Bustos, Owner	26 Spencer Place, Garfield, NJ 07026	Cobra Communications & Installations, LLC
Marianne Cammarata, Manager	349 W. Prospect Ave., Keyport, NJ 07735	Perfection Erectors, LLC Perfection Erectors, LLC
Vincent Frank Cammarata, Owner	349 W. Prospect Avenue, Keyport, NJ 07735	Perfection Erectors, LLC Perfection Erectors, LLC
Hugo Canabe, CEO	696 Elm St, Kearny, NJ 07032	HFC Painting
Frank Carpine, Owner	100 Liberty Dr, Millville, NJ 08332	Heritage Hills Estates
Salvatore A Casella III, President	362 Friendship Road, Clarksboro, NJ 08020	G.F.I. Siteworks, Inc. G.F.I. Siteworks, Inc.
Angelo Castelli, President	48 E. Central Blvd., Palisades Park, NJ 07650	I.K.E. Electrical Corp.
Tracy Cavallaro, President	1038 Old York Road, Raritan, NJ 08869	Tri-State Insulators, LLC
Manuel Chaguan, Owner	85 Prospect Ave., Irvington, NJ 07111	J G Roofing, LLC
Shawn Chalmers, Owner	337 Crown Street, Brooklyn, NY 11211	Chalmers Construction LLC.
James Chaney, President	610 County Meadows Rd., Nicholls, GA 31554	JC Builders
Noe Chanez, Principal	55 Miller Ave., Somerset, NJ 08873	Chanez Landscaping, LLC
Christine Charles, Vice-President	396 Cherry Ln, Mendham, NJ 07945	All County Pipeline & Site Excavation Inc.
Eric Charles, President	396 Cherry Ln, Mendham, NJ 07945	All County Pipeline & Site Excavation Inc.
Arkadiusz Chwedczuk, Owner	716 11th Avenue, Toms River, NJ 08757	Real Construction LLC
Albert Chwedczuk, Owner	1984 Whitesville Road, Toms River, NJ 087055	Ren Construction
Andrzej Citak, Vice-President	556 Humboldt St, Brooklyn, NY 11222	Cityline Contracting Inc.
Thomas Clark, Owner / Officer	145 Old Halfway Rd., Barnegat, NJ 08005	Thomas Clark Fiberglass, LLC
Olga Conteras, Vice-President	677 Old Highway 64, Etowah, NC 28729	Antiveros Construction, Inc.
William Coons, Owner	23178 Summer View Circle, Three Springs, PA 17264	Coons Construction, LLC
Steven Crider, Member	507 Pressler Street, Apt. 2128, Austin, TX 78703	Crider Americas Solar LLC
Jeanne Crispino, Vice-President	15 Lewis Street, Eatontown, NJ 07724	Twin Industries
Joseph Csakvary, President	163 Breakneck Road, Highland Lakes, NJ 07422	Joseph Csakvary, Inc.
Emanuel Cucco, Owner	1435 71st Street, Brooklyn, NY 11228	J.C. Maintenance & Repair

<u>Owners/ Officers</u>	<u>Address</u>	<u>Company Name</u>
Nuno Cunha, Owner	35 Carmen Ct., Newark, NJ 07105	Cunhas Construction Inc.
Anthony Davis, Vice-President	363 Northfield Avenue, Livingston, NJ 07039	Ranco Mechanical, Inc.
Kenneth Davis, President	2 Melba Drive, Newton, NJ 07860	Ranco Mechanical, Inc.
Dane DeForest, President	2406 Herbertsville Road, Point Pleasant, NJ 08742	Dane DeForest Demolition, Inc.
Patrick Dell'Aquila, President	55 Brookview Drive, Woodcliff Lake, NJ 07677	Elevator Medic Corporation
Patrick Dell'Aquila, President	55 Brookview Drive, Woodcliff Lake, NJ 07677	Ideal Elevator Services
Nelson DeOliveira, President	276 Highland Ave, Kearney, NJ 07032	Patrick Dell'Aquila
Joe DeSalvo, Jr., Owner	149 Montross Ave., Rutherford, NJ 07070	East Coast Touch Enterprises LLC
John Dever, Owner	1086 Mays Landing Road, Somers Point, NJ 08234	J.D.S Electric, Inc.
Balwant DeVre, President	21 Patriot Crossing, Rockaway, NJ 07866	Metal Fab Atlantic LLC
James DiLorenzo, Vice-President	440 Mantua Avenue, Paulsboro, NJ 08066	TQM Construction Corporation
Lee Dinenberg, President	2816 Coronado Way, Vero Beach, FL 32960	G.F.I. Siteworks, Inc.
Dorothy Dobiecka, President	556 Humboldt Street, Brooklyn, NY 11222	G.F.I. Siteworks, Inc.
Florian Dobre, Partner	526 Sheridan Ave, Roselle, NJ 07203	SP-One LLC
Ted Dobrzanski, CEO	138 Stonehenge Dr, Toms River, NJ 08753	Cityline Contracting Inc.
John Domingues, Owner	402 Market St, Newark, NJ 07105	B & B Atlantic LLC
Michele Doyle, Member	115 Millstone Way, Monroeville, NJ 08343	TJD Construction
William J. Doyle, President	200 Pine Rd., Hammonton, NJ 08037	Ted Dobrzanski
Stanislaw Dziuba, Vice-President	69 West Shore Drive, Pennington, NJ 08534	Precise Builders LLC
Kevin G. Eib, President	29 Monmouth Road, Monroe Twp., NJ 08831	Trinity Paving, LLC
Hector Estrada, Owner	432 52nd Street Apt 2, West New York, NJ 07093	Highway Safety Systems Inc.
Justin Ettore, Vice-President	52 Brass Castle Road, Washington, NJ 07882	Old World Construction, Inc.
John Ettore, Owner	1453 Tooz Place, South Plainfield, NJ 07080	Division Ten Installations, LLC
Matthew Ettore, Vice-President	8 Brookside Drive, Warren, NJ 07059	Estrada & Roca LLC
Jonathan Ettore, President	7 Craig Road, Readington, NJ 08853	Arete Development Inc.
Margaret Farina, Owner	30 Monsignor Deluca Plaza, Nutley, NJ 07110	Arete Development Inc.
Tania Felix-Claudio, Owner	4615 N. front St., 2nd Floor, Philadelphia, PA 19140	Arete Development Inc.
Hugo Fernandes, Owner	90 Willow Street, Carteret, NJ 07008	Arete Development Inc.
Michael F. Ferro Jr., Member	89 Jeanne Court, Stamford, CT 06905	Arete Development Inc.
Theodore Fiore, Owner	9 Silver Spring Court, East Hanover, NJ 07936	Arete Development Inc.
Thomas Fittin, Owner / Officer	2243 Edgar Rd, Point Pleasant Beach, NJ 08742	Metropolitan Stone & Tile, LLC
Donald Fleming, President	340 Reservoir Road, Boonton, NJ 07005	Victor Construction, Inc
Theresa Frajdenberg, President	110 South Harding Highway, Landisville, NJ 08326	DM Fernandes Contracts LLC
Fabricio Franco, Owner	1406 Lexington Pl., Elizabeth, NJ 07208	D & B Partners LLC
Scott Frasca, Manager	326 Coles Mill Road, Williamstown, NJ 08094	same
Rachel Frasca, Owner	326 Coles Mill Road, Williamstown, NJ 08094	T. Fiore Demolition, Inc.
Lori A. Frisina, President	235 Grand Avenue, Rutherford, NJ 07070	same
Tania Gaga, Vice-President	121 Diamond Lane, Manalapan, NJ 07726	Fittin Construction, LLC
Gabino Galindo, Owner	1025 23rd St, Paterson, NJ 07513	C & E Contracting, Inc.
Dean Gallo, Owner	245 Emanuel Street, Trenton, NJ 08610	CRC Concrete Raising of South Jersey, Inc.
Harry Gallo, Secretary	245 Emanuel Street, Trenton, NJ 08610	Old City Remodeling
Cesar Garcia, Owner	64 Grandview Ave, North Plainfield, NJ 07060	Blue Skies Electric L.L.C.
Randy Garciga, Owner	13353 NE 17th Avenue, Miami, FL 33181	Blue Skies Electric L.L.C.
Randy Garciga, Owner	13353 NE 17th Avenue, North Miami, FL 33181	Industrial Concrete Const. of NJ, Inc.
John Garza, Owner	768 Chambers St., Trenton, NJ 08611	Terra-Tech Construction, Inc.
		Galindo Const. LLC
		DG Construction & Renovations LLC
		DG Construction & Renovations LLC
		Emanuel Drywall Services, Inc
		JTG Scaffolding & Hoisting LLC
		JD Scaffold Inc.
		Garza Contracting LLC

Owners/ Officers**Address****Company Name**

John Giannattasio, Member	89 Jeanne Court, Stamford, CT 06905	D & B Partners LLC same
Antonio Gomes Jr., President	41 Hamilton Ave, Kearny, NJ 07032	CRC General Constructors Inc.
Antonio Gomes Sr., President	164 Green Street, Newark, NJ 07105	Crossroad Construction Corp.
Zbigniew Grabowski, Owner	35 Jersey Street, East Rutherford, NJ 07073	Grab Heating and Air Conditioning, LLC.
James T. Grace, Owner	14 Surrey Lane, Willingboro, NJ 08046	The Grace Brothers
Jethro Grace Jr., Owner	311 Colonial Road, Edgewater Park, NJ 08010	The Grace Brothers
Paul Grillo, Owner	207 Butlerr Ave, Staten Island, NY 10307	Area Fuel
Paul Grillo, Owner	207 Bulter Ave, St. Island, NY	Area Fuel
Jeffrey Grize, Owner	3477 S. Blackhorse Pike, Williamstown, NJ 08094	Turfscapes LLC
Curillo Guaman, Owner	197 Broad Street, Newark, NJ 07104	CJC Builders Corp.
Maurice Guariglia, Owner / Officer	494 North Barbor Road, Colchester, VT 05446	Advantage Sport USA, Inc.
George Heigel, Vice-President	350 Main Street, Kersey, PA 15846	4 S Logging & Lumber Co., Inc.
Helen Henriquez, Owner	101 South Orachard Road, Vineland, NJ 08360	E & S Enterprises, LLC
Peter Herring, President	164 South Moetz Drive, Milltown, NJ 08850	Metroplex Products Co. Inc.
Calvin Hudson, Owner	126 Winding Ridge Road, Dover, DE 19904	Calvin's Floor Service, aka Calvin's Carpet Sert
Allanur Islambekov, Owner	11 Arboretum Dr., Jackson, NJ 08527	Vercon Building & Maintenance Corp.
Carole Johnson, Secretary	390 Seneca Road, St marys, PA 15857	4 S Logging & Lumber Co., Inc.
Kwang Hee Kim, Partner	685 Bergen Blvd., Ridgefield, NJ 07657	K&K Construction LLC
Ki Kuk Kim, Partner	685 Bergan Blvd., Ridgefield, NJ 07657	K&K Construction LLC
Zachary Kouhoupt, President	5923 Peach St, Mays Landing, NJ 08330	Natural View Landscapes LLC
Devin Lemere, Partner	300 Mamaroneck Ave, # 133, White Plains, NY 10605	360 Golf, LLC
Michael Lenec, Partner	300 Mamaroneck Ave, White Plains, NJ 10605	360 Golf, LLC
Segundo E. Llivicota, Member	164 Polk Street, Apt. #1, Newark, NJ 07105	M.E. Group, LLC
Roxanne Lloyd, President	2008 Carmel Road, Millville, NJ 08332	R & B Construction
Alan Lombardi, President	26 Whispering Way, Berkeley Hights., NJ 07922	Lombardi Enterprises, Inc.
Ann Lombardi, Secretary	26 Whispeiring Way, Berkeley Hights, NJ 07922	Lombardi Enterprises, Inc.
Fernando Lopes, President	65-67 7th Ave., East 1st Floor, Newark, NJ 07104	MF Speed Construction, LLC.
Frank Loureier, Vice-President	152 Jefferson St., Newark, NJ 07105	East Coast Touch Enterprises LLC
Nicole Lucas, President	12 Red Fox Run, Manalapan, NJ 08857	Terra-Tech Construction, Inc.
Keith Ludwig, Member	459 Rt 38 West, Maple Shade, NJ 08052	HFM Labor Ready LLC HFM Labor Ready LLC
Robert Lueders, Owner	1008 Ridge Drive, Union, NJ 07083	ACC Contractors Corp.
John H. Madara, President	319 Terrace St, Rahway, NJ 07065	Advantage Contracting & Entertainment Servis
Barbara Marano, President	163 Hillcreek Ave, Cranford, NJ 07016	The Boca Bay Group
Harold Marshall, Jr., Member	1800 Eva Street, Austin, TX 78704	Crider Americas Solar LLC
Vincent Mattina, Owner	22 Toms River Rd, Jackson, NJ 08527	Mattina Construction LLC
Lisa Mautone, Member	25 Roberts Road, Holmdel, NJ 07733	AMC Industries LLC same
Anna Mautone, Member	88 Stilwell Road, Holmdel, NJ 07733	AMC Industries LLC same
Denise Mautone, Member	18A South Bears Street, Holmdel, NJ 07733	AMC Industries LLC same
Evelyn McDermott, Owner	613 15th Ave, Belmar, NJ 07719	Ribles Locksmith & Hardware
George McNulty, President	125 East Broadway, Suite 507, Long Beach, NY 11561	Low Bid, Inc. SUSPENDED PENDING DEBAMENT
Robert Mesmer, Managing Member	24 Sand Bridge Road, Elmer, NJ 08318	Robert M. Mesmer, LLC
Anthony Mirabile, President	413-415 South Seventh St., Elizabeth, NJ 07202	Samco Construction Co. LLC
Keith Mishoe, Owner	341 Seaton Avenue, Roselle Park, NJ 07204	Chalmers Construction LLC.
William Mitchell, Owner	22 Greenwood Place, Flemington, NJ 08822	OCM Construction OCM Construction, LLC
Brad J. Moini, President	101 Buttonwood Lane, Freehold, NJ 07728	Brothers Landscaping J.H. Brothers Inc.

<u>Owners/ Officers</u>	<u>Address</u>	<u>Company Name</u>
Frank Montgomery, Owner	42 Bryant Rd., Waretown, NJ 08758	Frank Montgomery Builder
Timothy Morrison, President	2745 SR668N, Junction City, OH 43748	Wallmasters Modular Inc.
William Morrissey, President	59 Lynwood Road, Cedar Grove, NJ 07009	Team Equipment LLC
Raymond G. Mozak, Owner	1423 Teresa Drive, Fort Lee, NJ 07024	William Morrissey
John Mullen, Jr., Owner	45 Fairfield Place, West Caldwell, NJ 07006	Raymond Mozak Plumbing & Heating
John Mullen, Sr, President	45 Fairfield Place, West Caldwell, NJ 07006	Mullen & Sons Contractors, Inc.
Joseph Niceta, Owner	2119 Merritt Drive, Northfield, NJ 08225	Mullen & Sons Contractors, Inc.
Uju A. Obiorah, President	259 West Forest Avenue, Englewood, NJ 07631	Niceta Electric
Inno Obiorah, Manager	658 Rutgers Pl, Paramus, NJ 07652	Envirocare Enterprises, Inc.
Erezy Ohana, Owner	60 Miller Road, Montgomery, NY 12549	Envirocare Enterprises, Inc.
Luis Oliveras, Owner	644 East 2nd St., Plainfield, NJ 07060	Envirocare Enterprises, Inc.
Krzysztof Oprzadek, President	19 Woodville Rd, Hopewell, NJ 08525	Envirocare Enterprises, Inc.
Brian O'Shea, Owner	1041 Glassboro Rd. D-2, Williamstown, NJ 08094	Ohana Metal & Iron Works Inc.
Mahesh Patel, Owner	828 Highland Ave, Paramus, NJ 07652	Caslo Drywall Corp.
Brian Patterson, President	11 Arlene Drive, West Long Branch, NJ 07764	Old World Construction, Inc.
David Peckham, Owner	15 Elm Street, Old Saybrook, CT 06475	American Welding Services
Nicola Pengue, President	4 Camelot Avenue, Monroe Township, NJ 08831	American Welding Services, Inc.
Julio Pereira, Vice-President	304 Crimson Circle, Oakhurst, NJ 07755	Coplen Management, Inc.
Antonio Pereira, President	159 Locust Avenue, West Long Branch, NJ 07764	Brian Patterson Mechanical Contracting, Inc.
Manuel Pereira, Owner	194 Monmouth Ave., Long Branch, NJ 07740	Resco, LLC
James Perrone, Owner	74 Glenroy Road East, Fairfield, NJ 07004	Hallmark Electric, LLC
Ellen Petric, President	1162 Greenpond Road, Newfoundland, NJ 07435	NT&P Construction Inc.
Steven Petric, Vice-President	1162 Greenpond Road, Newfoundland, NJ 07435	Pax Construction Corp.
Armando Piedade, President	265 Wilson Avenue, Kearny, NJ 07032	Pax Construction Corp.
Alicirio Jose Santana Pires, Owner	141 RT. 130 South, Suite 192, Cinnaminson, NJ 08077	PER Construction LLC
Richard Pluese, Vice-President	66 E Cedar Avenue, Marlton, NJ 08053	Perrone Trucking LLC
Kenneth Pontari, Partner	213 West Edgewood Ave., Linwood, NJ 08221	Petric & Associates, Inc.
Sharleen Poppalardo, Managing Member	11 Muirfield Court, Medford, NJ 08055	Petric & Associates, Inc.
Christopher Poppe, President	317 Greenridge Road, Franklin Lakes, NJ 07417	Conex Construction Corp.
Glen P. Poppe, Secretary	795 Susquehanna Ave, Franklin Lakes, NJ 07417	Five Star Quality Construction
Jazmine Price, President	744 South St Unit 65, Philadelphia, PA 19147	Apex Tower Services, Inc.
Wojciech Puchajda, Owner	10 Jeanette St., Carteret, NJ 07008	Shoreline Marine Construction, LLC
Manuel Quito, Member	164 Polk Street, Apt. 1, Newark, NJ 07105	Turf Services Express LLC
Rafael Ramos, President	120 Cantello Street, Union City, NJ 07087	Centurion Companies Inc.
Luis Riano, President	13 Poppy Ave., Neptune, 07753	Centurion Companies Inc.
Juan Riano, Owner	58 Steiner Ave., Neptune City, NJ 07753	Green Diamond Roofing & Live Roof, LLC
John Riley Jr, Managing Member	140 Harrison Avenue, Fair Haven, NJ 07704	Octagon Construction
Lauchland Roberts, President	2801 Remington Street, Suite 3, Fort Collins, CO 80526	Octagon Construction
Jose Roca, Owner	468 9th St, Apt # 2, Palisades Park, NJ 07650	M.E. Group, LLC
Mark Rodrigues, President	523 Hamilton Avenue, Kingston, PA 18704	Everest Masonry Construction, Inc.
Eddy Rodriguez, Member	1100 W. 7th. St., Apt. A9, Plainfield, NJ 07063	Riano Brothers, LLC.
Maurice Rolando, Owner	165 Height's Ave., Fair Lawn, NJ 07410	Atanasia Lazo Gutierrez
Leonardo Marques Roncone, Managing	192 Emmet St., Newark, NJ 07105	Super Stars Construction Inc
Paul F Roscitt, President	262 Harmon Avenue, Fort Lee, NJ 07024	Ocean Blue Builders LLC
Gary Russo, President	3 Premier Way, Manalapan, NJ 07726	GST Power Service Group Inc.
		Estrada & Roca LLC
		Everest Masonry Constructors, Inc.
		Eddy Drywall, LLC
		Interstate Home Service Inc.
		Interstate Home Service Inc.
		Ronccone Construction, L.L.C.
		Ronccone Construction, L.L.C.
		Paul F. Roscitt Electric, Inc.
		GSR Architectural, Inc.
		GSR Architectural, Inc.

Owners/ Officers**Address****Company Name**

Christopher Rymal, Owner	1929 Darby Rd., Havertown, PA 19083	IBS, Inc.
Edward Sandora, President	15 North Branch River Rd., Branchburg, NJ 08876	Sandora & Spina Contracting Inc.
Michael Santos, President	988 Johnson Place, Apt. 4, Union, NJ 07083	AB Contracting & Developmernt LLC
Peter Santos, President	35 Elmwood Ave, Unit 2B, Union, NJ 07083	Arteo Contracting & Development Arteo Contracting & Development, Inc.
Jerson Saravia, Owner	223-10, 113th St, Queens Vaillage, NY 11429	Saravia Concrete Pumping Corp.
John Schiavo, Managing Member	6 Justa Lane, Cherry Hill, NJ 08003	Jamcon Construction LLC
Alfred Sciubba, Managing Member	3 Chadwick Drive, Voorhees Twp., NJ 08043	Allied Construction LLC. Allied Construction Management, LLC
Sheree Severini-Fittin, Member	2243 Edgar Rd., Point Pleasant Beach, NJ 08742	Fittin Construction, LLC
Paul Sexton, Owner	462 10th Ave., Paterson, NJ	Paul Sexton
Al Shan, President	108 Oak Glen Road, Toms River, NJ 08753	S & S Electric, LLC
Shawn Sheeley, President	130 Sheeley Road, Kersey, PA 15846	4 S Logging & Lumber Co., Inc.
Margaret Sherman, President	203 Woods Avenue, Bergenfield, NJ 07621	CPS Mechanical Contractors, Inc.
Andrzej Skora, President	67 Cox Cro Road, Toms River, NJ 08755	A.J. Skora Inc.
John Sorrentino, Owner	65 Fern St, Browns Mills, NJ 08015	Barzzini Construction
Gregorio Soto, Owner	153 Lewis Street, Perth Amboy, NJ 08861	Jack Mack Commercial Roofing, Inc.
Lek Tauthong, Owner	91 Graham St, Jersey City, NJ 07307	TAU Associates Plumbing & Mechanical LLC
Steven D. Testa, Owner	6 North Hill Dr., Lynnfield, MA 01940	Testa Corp.
John Thomas, President	202 Karen Drive, Scranton, PA 18505	Retail Store Painting
Ashish Thomas, Owner	6 Spruce Meadows Dr., Monroe, NJ 08831	MG Topflight
Nester Torres, Owner	161 Thomas St, Unit 1, Newark, NJ 07114	NDA & Construction, LLC
Raymond Van Peenen, President	3 Gates Place, Wayne, NJ 07470	Van Peenen Landscape Contractors, Inc. Van Peenen Landscape Contractors, Inc.
James Van Wyckhouse, Owner	46 Tam O Shanter Rd, Mahwah, NJ 07430	Top Notch Tree & Landscape, LLC
Luis Vargas, Owner	291 Jefferson Street, Paterson, NJ 07522	L and Y Roofing, LLC
Michael Verduci, President	12 Verduci Drive, Newtown, PA 18940	A.V. Construction, Inc.
Felipe Villagomez, Owner	160 Lincoln Street, Bridgeton, NJ 08302	Felipe Villagomez owner
Peter Vincent, Owner	129 Highland Ave, Jersey City, NJ 07306	Peter Vincent
Sheila Vlasich, Managing Member	7 Ginkgo Court, Upper Saddle River, NJ 07458	Nicola Matera & Sons L.L.C.
William Vlasich, Managing Member	7 Ginkgo Court, Upper Saddle River, NJ 07458	Nicola Matera & Sons L.L.C.
Simon Walcott, Owner	43 Fairview Avenue, Bergenfield, NJ 07621	K & S Fabrication & Welding, LLC
Ireneusz Waluk, Owner	70 Bordentown-Chesterfiel, Rd., Chesterfield, NJ 08515	Euro Construction
Jon J Warbeck, President	680 West Pine Brook Road, Lincoln Park, NJ 07035	Warbeck Construction Group LLC
Todd E. Warmingham, Owner	P.o. Box 215, Newport, NY 13416	Todd Cable Construction, LLC
Susan Wilder, President	101 Lookout Pass, Stormville, NY 12582	Wilder Drywall Wilder Drywall, Inc.
Magda Zamprogno, Other	65-67 7th Ave., East 1st Floor, Newark, NJ 07104	MF Speed Construction, LLC.
Agustin Zuniga, President	420 Broadway, Long Branch, NJ 07740	American Eagle Contractor, Inc.

EXHIBIT NO. 3

**DAVIS BACON ACT – LABOR STANDARDS PROVISIONS FOR
FEDERALLY ASSISTED CONSTRUCTION CONTRACTS
(EPA FORM 5720-4)**

AND

**USEPA ATTACHMENT 6 – REQUIREMENTS FOR
SUBRECIPIENTS THAT ARE GOVERNMENT ENTITIES**

Content Last Revised: Current as of 3/5/2014

CFR Code of Federal Regulations Pertaining to ESA

Title 29 – Labor Chapter I

Part 5 - Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction

Subpart A - Davis-Bacon and Related Acts Provisions and Procedures

Section Number: 5.5 Contract provisions and related matters.

§5.5 Contract provisions and related matters.

(a) The Agency head shall cause or require the contracting officer to insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a public building or public work, or building or work financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in §5.1, the following clauses (or any modifications thereof to meet the particular needs of the agency, *Provided*, That such modifications are first approved by the Department of Labor):

(1) *Minimum wages.* (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively

made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in §5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) *Withholding.* The (write in name of Federal Agency or the loan or grant recipient) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) *Payrolls and basic records.* (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor

shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency). The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency), the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been

made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the (write the name of the agency) or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) *Apprentices and trainees*—(i) *Apprentices*. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or

subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) *Trainees.* Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) *Equal employment opportunity.* The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) *Compliance with Copeland Act requirements.* The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) *Subcontracts.* The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the (write in the name of the Federal agency) may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) *Contract termination: debarment.* A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) *Compliance with Davis-Bacon and Related Act requirements.* All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) *Disputes concerning labor standards.* Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) *Certification of eligibility.* (i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(b) *Contract Work Hours and Safety Standards Act.* The Agency Head shall cause or require the contracting officer to insert the following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by §5.5(a) or 4.6 of part 4 of this title. As used in this paragraph, the terms *laborers* and *mechanics* include watchmen and guards.

(1) *Overtime requirements.* No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless

such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) *Violation; liability for unpaid wages; liquidated damages.* In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) *Withholding for unpaid wages and liquidated damages.* The (write in the name of the Federal agency or the loan or grant recipient) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) *Subcontracts.* The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in §5.1, the Agency Head shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Agency Head shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or

subcontractor will permit such representatives to interview employees during working hours on the job.

(The information collection, recordkeeping, and reporting requirements contained in the following paragraphs of this section were approved by the Office of Management and Budget:

Paragraph	OMB Control Number
(a)(1)(ii)(B)	1215-0140
(a)(1)(ii)(C)	1215-0140
(a)(1)(iv)	1215-0140
(a)(3)(i)	1215-0140,
	1215-0017
(a)(3)(ii)(A)	1215-0149
(c)	1215-0140,
	1215-0017

[48 FR 19540, Apr. 29, 1983, as amended at 51 FR 12265, Apr. 9, 1986; 55 FR 50150, Dec. 4, 1990; 57 FR 28776, June 26, 1992; 58 FR 58955, Nov. 5, 1993; 61 FR 40716, Aug. 5, 1996; 65 FR 69693, Nov. 20, 2000; 73 FR 77511, Dec. 19, 2008]

EFFECTIVE DATE NOTE: At 58 FR 58955, Nov. 5, 1993, §5.5 was amended by suspending paragraph (a)(1)(ii) indefinitely.

Attachment 2

Wage Rate Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)

Preamble

With respect to the Clean Water and Safe Drinking Water State Revolving Funds, EPA provides capitalization grants to each State which in turn provides subgrants or loans to eligible entities within the State. Typically, the subrecipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman Numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Section 1-5.

Occasionally, the subrecipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in Roman Numeral II, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), below and for compliance as described in Section 11-5.

II. Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113- 6) For Subrecipients That Are Not Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its DB responsibilities when DB applies to EPA awards of financial assistance under the FY2013 Continuing Resolution with respect to subrecipients that are not governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient for guidance. If a State recipient needs guidance, the recipient may contact Julie Milazzo at Milazzo.julie@epa.gov or at 415-972-3687, EPA Grants Management Office for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at <http://www.dol.gov/whd/>

Under these terms and conditions, the subrecipient must submit its proposed DB wage determinations to the State recipient for approval prior to Including the wage determination in any solicitation, contract task orders, work assignments, or similar instruments to existing contractors.

1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.

Under the FY 2013 Continuing Resolution, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients must obtain proposed wage determinations for specific localities at www.wdol.gov. After the Subrecipient obtains its proposed wage determination, it must submit the wage determination to INSERT STATE CONTACT NAME, EMAIL, and TELEPHONE NUMBER for approval prior to inserting the wage determination into a solicitation, contract or issuing task orders, work assignments or similar instruments to existing contractors (ordering instruments unless subsequently directed otherwise by the State recipient Award Official).

(b) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov on a weekly basis to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(c) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.G(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the

subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2013 Continuing Resolution, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act {29 CFR part 3}), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov ..

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics,

including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

{1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

{2) The classification is utilized in the area by the construction industry; and

{3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

{B) If the contractor and the laborers and mechanics to be employed in the classification {if known}, or their representatives, and the subrecipient{s) agree on the classification and wage rate {including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient{s) to the State award official. The State award official will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

{C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the subrecipient{s) do not agree on the proposed classification and wage rate {including the amount designated for fringe benefits, where appropriate), the award official shall refer the request, and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

{D) The wage rate {including fringe benefits where appropriate) determined pursuant to paragraphs {a){1){ii){B) or {C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

{iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

{iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary

of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s) shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR S.S(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR S.S(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required

weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees—

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is

not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

{6} Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a){1} through {10} and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a){1}.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a){1}.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a){1}, {2}, {3}, and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient shall upon the request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (a)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three

years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

- (a). The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.
- (b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence."
- (c). The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB . In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.
- (d). The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item S(b) and (c) above.
- (e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <http://www.dol.gov/whd/america2.htm>.

EXHIBIT NO. 4

CONTRACT MODIFICATION PROPOSAL AND ACCEPTANCE FORM

Use of the Change Order Form entitled "Contract Modification Proposal and Acceptance"

- When the Loanee wishes to issue a change to the contract, the attached "Contract Modification Proposal and Acceptance" form should be used as a request for proposal. Upon final settlement of the change, this same form is then completed and serves as the contract modification.
- The Loanee in requesting a proposal for a change would execute items 1 through 8 (exclusive of the revised contract price and duration data) and 9 through 12. Pages 1 and 2 of this form are then forwarded to the contractor, specifying scope of work and requesting the contractor's proposal.
- The contractor should execute page 2 of the form. He then submits pages 1 and 2 of the form as his proposal, attaching additional sheets as necessary to provide his detailed breakdown of costs.
- Upon negotiation of a final settlement, the Loanee completes page 1 of the form, and all concerned parties (Contractor, Engineer, Owner) sign this document as the contract modification.
- Page 3 of the form is executed by the Loanee for documentation of the change, and to provide the necessary details for review by the Regulatory Agencies.
- Submit a minimum of one original with raised engineer's seal and one copy. It is suggested that one original be kept for your records.

Detailed Instructions for Executing "Contract Modification Proposal and Acceptance" Form

Item 1. Enter the name of the Loanee.

Item 2. Enter State Project number.

Item 3. Enter the contract number or designation.

Item 4. Enter the number identifying this modification.

Item 5. Enter the name of the Contractor.

Item 6. Enter the project title and location.

Item 7. Requests a proposal for the specified change order work, but does not direct contractor to proceed. The owner or his authorized representative must execute this statement by signature with date and title blocks entered.

Item 8. Provide a clear description of the scope of work for this change. Upon final settlement of the modification costs, enter cost data by line item for unit priced items or by sum; and state total cost of this modification – net increase, decrease or no change in contract price. Enter appropriate information for any change in contract time, including number or calendar days involved. The modification is executed when all appropriate signatures are included.

Items 9 – 12. Same as items 1 – 4.

Item 13. Executed by the contractor, stating net effect of change in appropriate box for money and time. A detailed breakdown must be provided in this item; and appropriate signature of authorized representative of contractor included.

Item 14. Enter the Loanee's name and State Project number.

Item 15. Enter the contract number or designation.

Item 16. Enter number identifying this modification.

Item 17. Enter appropriate financial data.

Item 18. Explain and justify the reasons for this change order.

Item 19. Explain all other impacts resulting from this change with estimate of costs involved. This should include impact on other contractors and the Consulting Engineers.

Item 20. Document that negotiations were held as required by the regulations and explain the events leading to the final settlement in price and time. This statement should include, at a minimum, date and location of negotiations, persons attending, summary of negotiations leading to final price and time settlements, and a statement that the agreed-to price is "fair and reasonable".

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- The Loanee in requesting a proposal for a change would execute items 1 through 8 (exclusive of the revised contract price and duration data) and 9 through 12. Pages 1 and 2 of this form are then forwarded to the contractor, specifying scope of work and requesting the contractor's proposal.
- The contractor should execute page 2 of the form. He then submits pages 1 and 2 of the form as his proposal, attaching additional sheets as necessary to provide his detailed breakdown of costs.
- Upon negotiation of a final settlement, the Loanee completes page 1 of the form, and all concerned parties (Contractor, Engineer, Owner) sign this document as the contract modification.
- Page 3 of the form is executed by the Loanee for documentation of the change, and to provide the necessary details for review by the Regulatory Agencies.
- Submit a minimum of one original with raised engineer's seal and one copy. It is suggested that one original be kept for your records.

Detailed Instructions for Executing "Contract Modification Proposal and Acceptance" Form

Item 1. Enter the name of the Loanee.

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Item 3. Enter the contract number or designation.

Item 4. Enter the number identifying this modification.

Item 5. Enter the name of the Contractor.

Item 6. Enter the project title and location.

Item 7. Requests a proposal for the specified change order work, but does not direct contractor to proceed. The owner or his authorized representative must execute this statement by signature with date and title blocks entered.

Item 8. Provide a clear description of the scope of work for this change. Upon final settlement of the modification costs, enter cost data by line item for unit priced items or by sum; and state total cost of this modification – net increase, decrease or no change in contract price. Enter appropriate information for any change in contract time, including number or calendar days involved. The modification is executed when all appropriate signatures are included.

Items 9 – 12. Same as items 1 – 4.

Item 13. Executed by the contractor, stating net effect of change in appropriate box for money and time. A detailed breakdown must be provided in this item; and appropriate signature of authorized representative of contractor included.

Item 14. Enter the Loanee's name and State Project number.

Item 15. Enter the contract number or designation.

Item 16. Enter number identifying this modification.

Item 17. Enter appropriate financial data.

Item 18. Explain and justify the reasons for this change order.

Item 19. Explain all other impacts resulting from this change with estimate of costs involved. This should include impact on other contractors and the Consulting Engineers.

Item 20. Document that negotiations were held as required by the regulations and explain the events leading to the final settlement in price and time. This statement should include, at a minimum, date and location of negotiations, persons attending, summary of negotiations leading to final price and time settlements, and a statement that the agreed-to price is "fair and reasonable".

CONTRACT MODIFICATION PROPOSAL AND ACCEPTANCE

1. ISSUING OFFICE	2. PROJECT NO.	3. CONTRACT NO.	4. MODIFICATION NO.
5. TO (CONTRACTOR)		6. PROJECT LOCATION AND DESCRIPTION	

7. A proposal is required for making the hereinafter described change in accordance with specification and drawing revisions cited herein or listed in attachment hereto. Submit your proposal in space indicated on Page 2, attach detailed breakdown of prime and sub-contract costs (See the clause of this contract entitled, "Changes". DO NOT start work under this proposed change until you receive a copy signed by the Contracting Officer or a directive to proceed).

Date	Type Name and Title	Signature
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8. DESCRIPTION OF CHANGE: Pursuant to the clause of this contract covering changes, the contractor shall furnish all labor and material, and all work necessary to accomplish the following described work:

As a result of the above, the contract price is revised as follows:

ITEM NO.	ITEM DESCRIPTION	UNIT PRICE	ESTIMATED QUANTITY	TOTAL COST
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TOTAL COST OF THIS MODIFICATION \$ _____

The contract time is hereby: *increase* *decrease* or *remains the same* by _____ calendar days as a result of this modification.

The foregoing modification is hereby accepted:

CONTRACTOR	OWNER	(NJPE SEAL)	ENGINEER
BY:	BY:	BY:	BY:
DATE:	DATE:	DATE:	DATE:

APPROVAL:

STATE OF NEW JERSEY	DATE
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CONTRACT MODIFICATION PROPOSAL AND ACCEPTANCE

9. ISSUING OFFICE	10. PROJECT NO.	11. CONTRACT NO.	12. MODIFICATION NO.
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13. CONTRACTOR'S PROPOSAL - CHANGE IN CONTRACT PRICE (Detailed breakdown, attach additional sheets as necessary)

(Proposed)

NET INCREASE \$ _____	NET DECREASE \$ _____	CALENDAR DAYS INCREASE _____ DAYS
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DATE:	TYPE NAME AND TITLE:	SIGNATURE:
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CONTRACT MODIFICATION PROPOSAL AND ACCEPTANCE

14. ISSUING OFFICE & PROJECT NO.	15. CONTRACT NO.	16. MODIFICATION NO.									
<table style="width: 100%; border-collapse: collapse;"><tr><td style="width: 55%; padding: 2px;">17. ORIGINAL CONTRACT BID PRICE.....</td><td style="width: 5%; text-align: center; padding: 2px;">\$</td><td style="width: 40%; border-bottom: 1px solid black;"></td></tr><tr><td style="padding: 2px;">TOTAL OF PREVIOUS CHANGE ORDERS.....</td><td style="text-align: center; padding: 2px;">\$</td><td style="border-bottom: 1px solid black;"></td></tr><tr><td style="padding: 2px;">TOTAL CONTRACT COST INCLUDING CHANGE ORDERS.....</td><td style="text-align: center; padding: 2px;">\$</td><td style="border-bottom: 1px solid black;"></td></tr></table>			17. ORIGINAL CONTRACT BID PRICE.....	\$		TOTAL OF PREVIOUS CHANGE ORDERS.....	\$		TOTAL CONTRACT COST INCLUDING CHANGE ORDERS.....	\$	
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TOTAL CONTRACT COST INCLUDING CHANGE ORDERS.....	\$										
18. NECESSITY FOR CHANGE AND REASON FOR OMISSION FROM PLANS AND SPECIFICATIONS:											
19. OTHER IMPACTS RESULTANT OF THIS CHANGE:											
20. RESUME OF NEGOTIATIONS OR RECOMMENDATIONS (Loanee's Representative):											
DATE:	TYPE NAME AND TITLE OF LOANEE'S REPRESENTATIVE:	SIGNATURE:									

EXHIBIT NO. 5

**NJAC 7:22-9 AND
NJAC 7:22-10.11,12**

NJAC 7:22-9

The rule below includes the amendments adopted to this subchapter on January 3, 2006.

Subchapter 9. Awarding Contracts for State Assisted Projects to Small Business Concerns Owned and Controlled by Socially and Economically Disadvantaged Individuals

7:22-9.1 Scope and purpose

(a) This subchapter establishes procedures for providing opportunities for socially and economically disadvantaged ("SED") contractors and vendors to supply materials and services under State financed construction contracts for environmental infrastructure facilities. To implement the policies established in N.J.S.A. 58:11B-26, 40:11A-41 et seq., and 52:32-17 et seq., this subchapter applies to environmental infrastructure projects receiving financial assistance from the Department and the Trust pursuant to N.J.A.C. 7:22-3, 4 and 6 and 7:22A-6 and 7. Under the provisions of N.J.A.C. 7:22-3, 4 and 6 and 7:22A-6 and 7, the Department and the Trust require recipients of Trust and Fund loans and other assistance to establish such programs for socially and economically disadvantaged small business concerns, to designate a project compliance officer, and to submit to the Department and Trust procurement plans for implementing the SED program. In addition, N.J.A.C. 7:22-3.17(a)24, 4.17(a)24, 6.17(a)24 and 7:22A-2.4(a) provide that a goal of not less than 10 percent be established for the award of contracts to small business concerns owned and controlled by one or more socially and economically disadvantaged individuals. The goal of 10 percent applies to the total amount of all contracts for building, materials and equipment, or services (including planning, design and building related activities) for a construction project. Where a local government unit has a SED participation goal which exceeds 10 percent of the total amount of all contracts, the local government unit must comply with both the Department's rules and the local minority and women-owned business ordinances.

(b) This subchapter also establishes the standards and procedures that will apply to the contracting agencies of grant or loan recipients in the awarding and making of contracts under their SED programs.

7:22-9.2 Definitions

The following words and terms, as used in this subchapter, will have the following meanings unless the content clearly indicates otherwise.

"Building" means the acquisition, erection, alteration, remodeling, improvement or extension of an environmental infrastructure facility.

"Construction" includes, but is not limited to:

1. The preliminary planning to determine the economic and engineering feasibility of environmental infrastructure facilities, the engineering, architectural, legal, fiscal, and economic investigations and studies, surveys, design, plans, working drawings, specifications, procedures, and other action necessary for the construction of environmental infrastructure facilities;
2. The building of, or purchase of land for, environmental infrastructure facilities; and
3. The inspection and supervision of the building of environmental infrastructure facilities.

"Contract" means any written agreement with a professional service or construction contractor related to the construction of an environmental infrastructure project.

"Contracting agency" means:

1. The governing body of a local government unit or any department, branch, board, commission, committee, authority, agency or officer of such local government unit possessing the authority to award and make contracts; or

2. The owner(s) or authorized representative(s) of a private entity.

"Contractor" means any party entering into a contract to provide or offering to provide building, materials and equipment, or services to a project sponsor for the construction of environmental infrastructure facilities. This includes, but is not limited to, planning and design, as well as building related services such as engineering, inspection and accounting.

"Contractor's plan" means the SED utilization plan submitted by the contractor to the project sponsor and to the Department establishing subcontracting opportunities that will fulfill the requirements of this subchapter.

"Department" means the New Jersey Department of Environmental Protection and its successors and assigns.

"Environmental infrastructure facilities" means wastewater treatment facilities, stormwater management facilities or water supply facilities.

"Financial agreement" means the legal instrument, including a grant agreement or loan agreement, executed between either the State of New Jersey or the Trust and the project sponsor for the construction of environmental infrastructure facilities.

"Local government unit" means a county, municipality, municipal or county sewerage or utility authority, municipal sewerage district, joint meeting, improvement authority or other political subdivision of the State authorized to construct, operate and maintain wastewater treatment or stormwater management facilities, or a State authority, district water supply commission, county, municipality, municipal or county utilities authority, municipal water district, joint meeting or any other political subdivision of the State authorized pursuant to law to operate or maintain a public water supply system or to construct, rehabilitate, operate or maintain water supply facilities or otherwise provide water for human consumption.

"New Jersey environmental infrastructure financing program" means the program for providing financing to project sponsors pursuant to N.J.A.C. 7:22-3, 4 and 6, and 7:22A-6 and 7.

"Office" means the Office of Equal Opportunity and Public Contract Assistance or other program of the Department of Environmental Protection with the responsibility for administration of this subchapter.

"Private entity" means the owner(s) of a nongovernmental community water system or a nonprofit noncommunity water system.

"Project" means the defined services for the construction of specified operable environmental infrastructure facilities as approved by the Department or the Trust in the project sponsor's financial agreement.

"Project compliance officer" means an officer or employee of the project sponsor who is designated by the project sponsor to monitor and enforce compliance with the affirmative action and SED requirements of the applicable program rules and this subchapter.

"Project plan" means the proposal submitted at the time of application by the project sponsor to the Department establishing the SED utilization plan and its requirements.

"Project sponsor" means any local government unit or private entity that seeks a loan or grant pursuant to N.J.A.C. 7:22-3, 4 and 6 and 7:22A-6 and 7.

"SED utilization plan" means a written document outlining the entire project work, the estimated length of time it will take to complete the project, each significant segment of the project on which SEDs will or may participate, and a description of how SEDs will be contacted.

"Socially and economically disadvantaged small business concern" or "SED" means any small business concern:

1. Which is at least 51 percent owned by one or more socially and economically disadvantaged individuals; or, in the case of a publicly owned business, at least 51 percent of the stock of which is owned by one or more socially and economically disadvantaged individuals; or, in the case of a joint venture, at least 51 percent of the beneficial ownership interests are legitimately held by a SED; and

2. Whose management and daily business operations are controlled by one or more socially and economically disadvantaged individuals; and

3. Which is a full participation subcontractor in that the SED is responsible for the execution of a distinct element of work and carries out the work responsibility by actually performing, managing and supervising the task involved. Any deviation from this definition will automatically classify the SED as a broker, middleman or passive conduit. These three functions are contrary to the spirit of the Trust Act and will not qualify a SED enterprise for State of New Jersey certification; and

4. Which has been certified pursuant to the New Jersey Uniform Certification Act (N.J.S.A. 52:27H-1 et seq.) or pursuant to the provisions of 49 CFR Part 23 by the New Jersey Commerce and Economic Growth Commission, the New Jersey Department of Transportation, the Port Authority of New York and New Jersey, the New Jersey Transit or other agencies deemed appropriate by the Office, as an eligible minority business or female business.

i. "Socially disadvantaged individuals" means those individuals who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities.

ii. "Economically disadvantaged individuals" means those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged.

iii. "Socially and economically disadvantaged individuals" shall include women, Black Americans, Hispanic Americans, Native Americans, Asian Americans, and members of other groups, or other individuals, found to be socially and economically disadvantaged by the Small Business Administration under Section 8(a) of the Small Business Act, as amended (15 USC 637(a)). Black Americans, Hispanic Americans, Native Americans and Asian Americans shall be defined as follows:

(1) "Black American" means a person having origins in any of the black racial groups in Africa;

(2) "Hispanic American" means a person of Spanish or Portuguese culture, with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;

(3) "Asian American" means a person having origins in any of the original peoples of the Far East, Southeast Asia, Indian Subcontinent, Hawaii, or the Pacific Islands;

(4) "Native American" means a person having origins in any of the original peoples of North America.

"Small business concern" means a business which is independently owned and operated and which is not dominant in its field of operation. A business is independently owned and operated if the management which controls the business is responsible for both its daily and long term operations.

"Subcontract" means an agreement to perform a portion of a contract.

"Subcontractor" means a third party that is engaged by the contractor to perform part of the work under a subcontract.

"10 percent SED utilization," "10 percent goal" and "10 percent" means SED business concern participation, which includes 7 percent for minority-owned SED business concerns and 3 percent for women-owned SED business concerns.

"Trust" means the New Jersey Environmental Infrastructure Trust established pursuant to the Trust Act.

"Trust Act" means the New Jersey Environmental Infrastructure Trust Act (N.J.S.A. 58:11B-1 et seq.), as amended and/or supplemented.

7:22-9.3 SED utilization requirements for projects

(a) A goal of not less than 10 percent (or a higher percentage as may be required by Federal law) of the total amount of all contracts for building, materials and equipment, or services for a project funded by a New Jersey environmental infrastructure facilities financing program must be awarded to SEDs.

(b) The 10 percent SED utilization requirement shall be accomplished by the following:

1. Bids shall be solicited on an unrestricted basis. The bid documents, however, shall include a statement to the effect that the successful bidder must fulfill the SED utilization requirements by subcontracting portions or the work to SEDs; or

2. Contractors also have the option of establishing unrestricted bidding procedures to fulfill the 10 percent SED utilization requirement for the project.

7:22-9.4 Requirement to develop SED Utilization Plan

(a) Each project sponsor shall develop, in consultation with the Office, a plan for achieving its SED utilization requirements (the "project plan"). Development of a plan shall be completed before the Department and, when relevant, the Trust may approve an application pursuant to the applicable program rules

(b) The project plan shall identify those contracts proposed to be bid on an unrestricted basis. For each unrestricted contract, the project plan shall also identify the SED utilization requirements that the successful bidder shall meet.

(c) All contractors, including SED contractors, shall submit their own SED utilization plan ("contractor's plan"), for the aspects of the project covered by the contract, to the project sponsor and to the Office within 30 days of the awarding of a contract. The Contractor's Plan shall contain provisions to meet the specific SED utilization requirements imposed upon the contractor by the project sponsor as well as to meet the general SED utilization requirements for the project pursuant to this subchapter.

(d) If the contractor does not comply with the requirements of the contractor's plan and the project sponsor does not take steps to otherwise comply with N.J.A.C. 7:22-9.3(a), the Department and, in the case of a Trust loan, the Trust, may take any of the actions or combinations thereof specified in N.J.A.C. 7:22-3.40 through 3.44, 7:22-4.40 through 4.44, 7:22-6.40 through 6.44 and 7:22A-1.8 through 1.13.

7:22-9.5 (Reserved)

7:22-9.6 Notice of SED utilization opportunities

(a) All project sponsors, at least 30 days prior to public advertisement for bids, shall notify the agencies specified in N.J.A.C. 7:22-9.13(a)8, of the availability of opportunities for SEDs to provide

services, to bid on unrestricted contracts or subcontracts, or to provide any other necessary purchase or procurement. The notice shall include a description of the type and scope of the services involved.

(b) All notices shall include a statement to the effect that the project or contract is funded in part by New Jersey wastewater treatment financing programs and the successful bidder must comply with all the provisions of N.J.A.C. 7:22-9.1 et seq. for the participation of small business enterprises owned and controlled by socially and economically disadvantaged individuals.

7:22-9.7 Advertisements for SED utilization

(a) All advertisements for bids shall include a statement to the effect that the project or contract is funded in part by New Jersey environmental infrastructure financing programs and the successful bidder must comply with the provisions of N.J.A.C. 7:22-9 for the participation of small business enterprises owned and controlled by socially and economically disadvantaged individuals.

(b) The advertisement for bids shall indicate that:

1. Awards will be made only to socially and economically disadvantaged business concerns that are certified by the New Jersey Commerce, Economic Growth and Tourism Commission, the New Jersey Department of Transportation, the Port Authority of New York and New Jersey, New Jersey Transit or other agencies deemed appropriate by the Office as eligible minority businesses or female businesses; or

2. The invitation to bid is on an unrestricted basis whereby the successful bidder must fulfill the SED utilization requirements. The agencies specified in N.J.A.C. 7:22-9.13(a)8 will have a list of eligible SED firms and shall, upon request, provide them to the project sponsor. The project sponsor shall, during the advertisement phase, provide copies of the list to all contractors on unrestricted contracts.

(c) The advertisement for bids shall be in such newspaper or newspapers and other periodicals identified by the agencies specified in N.J.A.C. 7:22-9.13 as will best give notice thereof to appropriate bidders and shall be sufficiently in advance of the purchase or contract to promote competitive bidding. In no case shall the advertisement for bids be published less than 30 days prior to the date fixed for receiving bids on the purchase or contract.

(d) In the case of a set aside contract, the newspaper or newspapers in which the advertisement for bids appears shall be selected by the contracting agency in consultation with the Office.

(e) If there are no responses to the bid solicitation from SEDs or if the successful bidder's proposal does not meet the SED utilization requirements, the successful bidder shall advertise and continue the search for SED participants for a minimum of 30 days after the contract is awarded. The contract shall include a provision to this effect.

7:22-9.8 (Reserved)

7:22-9.9 (Reserved)

7:22-9.10 Lowest bid resulting in payment of unreasonable price

(a) If the contracting agency determines that the acceptance of the lowest responsible bid will result either in the payment of an unreasonable price or in a contract otherwise unacceptable pursuant to the statutes and rules governing public contracts, the contracting agency shall reject all bids.

(b) Bidders and the office shall be notified of the rejection of all bids, the reasons for the rejection, and the contracting agency's intent to solicit bids for a second time.

(c) If the contracting agency determines a second time that the acceptance of the lowest responsible bid will result either in the payment of an unreasonable price or in a contract otherwise unacceptable pursuant to the statutes and rules governing public contracts, the contracting agency shall reject all bids and notify the Office and, after receipt of the Office's approval, shall amend the project plan accordingly.

(d) Bidders shall be notified of the cancellation, the reasons for the cancellation and the contracting agency's intent to resolicit bids on an unrestricted basis. SEDs may participate in the bidding on an unrestricted basis.

7:22-9.11 Project compliance officer

(a) Each project sponsor shall designate an officer or employee to serve as its project compliance officer.

(b) The project compliance officer shall be responsible for coordinating SED utilization efforts on the project and for monitoring and enforcing compliance with the affirmative action and SED requirements of the applicable program rules.

(c) SED utilization requirements shall be an agenda item at all contract award meetings and, wherever applicable, at preconstruction conference meetings regardless of whether a loan or grant agreement has been executed or not. Each project sponsor shall be responsible for notifying the Office of the time and place of such meetings.

(d) The project compliance officer shall attend all monthly construction progress meetings.

7:22-9.12 Reports

(a) The contracting agency shall submit its planning and design SED utilization report to the Office at the time of filing of its grant/loan application.

(b) Each project compliance officer shall submit the contracting agency's monthly progress reports to the Office. Once all SED contractors have been obtained, submittal of this report will no longer be required.

(c) Each project compliance officer shall submit a periodic report on behalf of the project sponsor to the Office according to a schedule announced by the Office. At a minimum, this construction report shall be submitted quarterly; that is, January, April, July and October. Where appropriate, the Office may approve a variation in the frequency of reporting requirements specified in (b) through (d) of this section. This report shall include the following information:

1. The value of each contract and subcontract awarded to SEDs and the total dollar value and number of contracts and subcontracts awarded to SEDs;

2. The percentage of SED utilization in comparison to the cost of each contract, as well as the total percentage of SED utilization (including set aside contracts) in comparison to overall project costs;

3. The types and sizes of the participating SEDs and the nature of goods and services being provided; and

4. The efforts made to publicize and promote the project sponsor's SED utilization plan.

(d) Contractors shall submit a quarterly construction report to the project sponsor and to the Office. The project compliance officer may be contacted for assistance if needed.

(e) The report forms required by (a) through (d) above shall be obtained from the Office.

(f) The project compliance officer shall submit reports or information in addition to what is required by (a) through (c) above when requested to do so by the Office.

(g) Failure to comply with the reporting requirements of (a) through (d) and (f) above may subject the project sponsor to the remedies for noncompliance with State and Trust loan or grant conditions specified in the applicable program rules.

7:22-9.13 Assessment of compliance

(a) Where the Office determines that a project sponsor has failed or is failing to meet the 10 percent SED utilization requirement, the project sponsor shall, upon the written request of the Office, submit the following:

1. Advertisements;
2. Signed contracts and subcontracts;
3. Documentation of solicitations of bids from SEDs;
4. Copies of Requests for Proposals;
5. Records of telephone quotations;
6. (Reserved);
7. Adequate and timely notice for encouraging SED participation; and
8. Proof that the assistance of State Agencies was solicited, including:

Office of Equal Opportunity and Public Contract Assistance
New Jersey Department of Environmental Protection
PO Box 402
Trenton, New Jersey 08625-0402

Division for the Development of Small Businesses and Women Businesses and Minority
Businesses
New Jersey Commerce and Economic Growth Commission
PO Box 835
1 West State Street
Trenton, New Jersey 08625-0835

(b) Where the project sponsor determines that a contractor has failed or is failing to meet the 10 percent SED utilization requirement, the contractor shall, upon the written request of the project sponsor, submit the documents specified in (a) above.

(c) The Office shall summarize in writing its evaluation of the reason given for noncompliance and the efforts made by the project sponsor or contractor to comply with its plan for achieving the 10 percent SED utilization requirement. The Office shall take into consideration good faith efforts made by the project sponsor or contractor to meet the goal to achieve the ten percent SED utilization requirement. These findings shall be submitted to the Department and, in the case of a Trust loan, to the Trust who, in conjunction with the Office, shall determine the nature and extent of the project sponsor's or contractor's noncompliance.

7:22-9.14 Penalties

Whenever a project sponsor or a contractor has failed to comply with the requirements of this subchapter, including the 10 percent requirement for SED utilization, the Department, or the Department and the Trust, in the case of a Trust loan recipient, may withhold all of the loan or grant money, or a portion thereof, and may take any of the other actions or combinations thereof specified in N.J.A.C. 7:22-3.40 through 3.44, 7:22-4.40 through 4.44, 7:22-6.40 through 6.44 and 7:22A-1.8 through 1.13 which are remedies for noncompliance with any of the conditions of a loan or grant.

7:22-9.15 Administrative hearings

(a) The Department and, in the case of a Trust loan, the Trust, shall make a determination regarding all disputes arising under this subchapter. The project sponsor shall specifically detail in writing the basis for its dispute. The Department and/or the Trust shall produce a decision in writing and mail or otherwise furnish a copy thereof to the project sponsor.

(b) A project sponsor may request an administrative hearing within 20 days of receipt of a decision by the Department and/or the Trust. The request for a hearing shall be sent to the Office of Legal Affairs, ATTENTION: Adjudicatory Hearing Requests, Department of Environmental Protection, PO Box 402, Trenton, New Jersey 08625-0402. The request for an administrative hearing shall specify in detail the basis for the appeal. Administrative hearings shall be conducted in accordance with the requirements of the Administrative Procedure Act, N.J.S.A. 52:14B-1 et seq. and the Uniform Administrative Procedure Rules, N.J.A.C. 1:1.

(c) Following receipt of a request for a hearing pursuant to (b) above, the Department and/or the Trust may attempt to settle the dispute by conducting such proceedings, meetings and conferences as deemed appropriate.

7:22-9.16 Severability

If any of the provisions of this subchapter are found to be invalid, the remainder of the provisions of this subchapter shall not be affected thereby.

NJAC 7:22 – 10.11
Design Requirements

NJ 7:22 – 10.12
Construction Phase Requirements

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(c) A mailing list shall be developed by the Department for each project, for use by the Department to inform the public and other interested parties of its decisions regarding the project. The mailing list shall include elected officials, Federal, State and local government agencies, environmental groups, and other interested groups and individuals appropriate to the planning area for the proposed project.

(d) In addition to the public hearing, the Department may require supplemental measures to inform and solicit comments from the public under the following conditions:

1. Where factors, such as delays in project implementation or errors in cost estimation, result in significant increases in the user cost burden prior to the award of financial assistance, the project sponsor may be required to place a retail or display advertisement in the body of a newspaper of general circulation in the planning area which describes the proposed project and the revised costs, including user cost, and which establishes a comment period of 30 days. A summary of any public comment received during the comment period shall be submitted by the project sponsor to the Department. Based on the response of the public to the advertisement, the Department will determine if further project evaluation is required.

2. Where, as a result of the re-evaluation of the environmental review conducted in accordance with N.J.A.C. 7:22-10.7, the Department determines that significant changes in the project or project impact have occurred, which warrant public input, the Department may determine that a supplemental public advertisement as in (d)1 above or a public hearing as in (b) above is required prior to award of financial assistance.

3. Where notice of the public hearing does not comply with the requirements of (b) above or where significant project issues including costs or impacts were not disclosed, the Department may determine that a supplemental public advertisement as in (d)1 above or a public hearing as in (b) above is required prior to award of financial assistance.

7:22-10.11 Design requirements

(a) The project sponsor shall prepare design plans and specifications which conform to the project alternative selected and approved in planning pursuant to the provisions of N.J.A.C. 7:22-10.4, 10.5 or 10.6 and which include mitigating measures developed during planning and incorporated in the approved planning documentation. In addition, the design plans and specifications shall conform to the minimum standards for each area of concern which is applicable to the proposed project as set forth below. All activities which are a part of the comprehensive environmental infrastructure project(s) for the planning area must conform to the requirements of this section, regardless of the eligibility of individual components of the project.

1. Any design revisions of the project which differ from the project as approved during planning shall be specifically identified.

2. Where any on-going environmental protection measures will be the responsibility of the project sponsor, the project sponsor shall submit a letter prior to loan award specifying that it will adhere to the scope of work approved by the Department.

(b) The contract documents shall be prepared to clearly identify environmental and cultural resources protection measures and shall conform to the following:

1. The format of the contract documents shall consolidate environmental and cultural resource protection/restoration measures in a single section of the design specifications as well as on appropriate sheets of the design plans. The specifications which spell out the environmental and cultural resource protection/restoration measures shall be identified in the specifications as having precedence over other potentially contradictory language contained elsewhere in the design contract documents. The specifications shall clearly state that, in instances where the provisions of a Department-issued permit contradict a provision of the specifications (including those identified in this subchapter), the environmental resources protection and/or restoration and cultural resource mitigation measures identified in the Department-issued permit shall govern.

2. Environmental resources protection and/or restoration measures, and cultural resource mitigation measures should generally include the following subject areas:

- i. General;
- ii. Clearing;
- iii. Erosion and sedimentation control;
- iv. Protection of environmentally critical areas;
- v. Stockpiling and waste disposal;
- vi. Prohibited construction procedures;

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- vii. Dust control;
- viii. Noise control;
- ix. Cultural resources;
- x. Dewatering;
- xi. Restoration;
- xii. Environmental maintenance bond; and
- xiii. Inspection.

3. The method of payment for environmental and cultural resource protection/restoration measures shall be specified in the applicable section of the contract documents. Where restoration and maintenance of environmental quality are necessary outside of the designated construction area or when measures for maintenance of environmental quality are required after the date of completion and acceptance of the environmental infrastructure facilities, the project sponsor shall clearly state the contractor's responsibilities in the specifications. The Department may require the project sponsor to include separate unit bid items for environmental and cultural resource restoration and/or mitigation.

4. Where construction will occur within or adjacent to environmentally critical areas, as approved by the Department, those areas shall be identified on design plans.

(c) Every effort shall be made to prevent and correct problems associated with erosion and sedimentation which could occur during and after project construction. At a minimum, design specifications shall incorporate the following erosion and sedimentation control measures:

1. All erosion and sedimentation control measures shall be in place prior to any grading operations or construction of proposed facilities and shall be maintained until construction is complete and the construction area is stabilized. After restoration is complete, temporary control measures shall be removed and disposed of properly.

2. All erosion and sedimentation control measures shall be constructed and maintained in accordance with the "Standards for Soil Erosion and Sediment Control in New Jersey," prepared by the New Jersey State Soil Conservation Committee, 1999, incorporated herein by reference, as amended and supplemented. Copies of the "Standards for Soil Erosion and Sedimentation Control in New Jersey" are available for a fee from the New Jersey Department of Agriculture, Soil Conservation Committee, or from the office of any of the 16 local conservation districts.

3. Disturbed areas that will be exposed in excess of 10 days shall be temporarily seeded and/or mulched, until proper weather conditions exist for establishment of permanent vegetative cover.

(d) Site and access clearing must be confined to approved construction areas. Protection of existing vegetation must be practiced wherever possible. At a minimum, the project sponsor shall include provisions in the contract documents which conform to the following:

1. Temporary and permanent easement widths must be reduced to the minimum feasible for the proposed construction. Unless specifically approved by the Department, permanent access roads must not be more than eight feet wide and there shall be no permanent access roads in environmentally critical areas. Access roads may be paved only where absolutely necessary, as determined by the Department.

2. Only those portions of the site which are absolutely necessary and essential for construction shall be cleared. Whenever possible, excavation shall include the removal and storage of topsoil from the site for future use. The length of time of ground disturbance shall be reduced to the minimum practicable, especially in environmentally critical areas. Ground disturbance shall be avoided until immediately preceding construction to minimize exposure of soils.

3. Trees and shrubs within construction easements, which are not required to be removed to permit construction, shall be protected to the drip line with appropriate protection measures such as snow fencing or batter boards. Trees and shrubs whose removal is necessary to facilitate construction shall either be replanted at the same location or replaced with nursery stock of the same kind. Trees of greater than 12 inches in diameter should be preserved whenever possible by implementing slight shifts in alignment or tunneling under tree roots. Specimen trees, as identified in "New Jersey's Big Trees" (1998) published by the Department's Division of Parks and Forestry listing specimen trees in the State, shall be preserved.

4. Except in heavily wooded areas, the plans shall designate trees and shrubs which are to be protected as well as trees and shrubs which are to be removed. In addition, plans shall provide details which depict methods of protection to the drip line.

5. In heavily wooded areas, every effort shall be made to avoid the destruction of common native trees and shrubs so as not to unduly disturb the ecological balance or environmental quality of the area. Trees of 12 inch

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diameter or greater should be preserved whenever possible and protected to the drip line. Where practical, common native trees and shrubs, of one through three inch caliper, which must be cleared from the construction area shall be stockpiled for use in restoration. Straggling roots shall be pruned. Trees which must be pruned to facilitate construction shall be cut cleanly and painted with tree paint. If a tree not intended to be removed is damaged, the wood shall be repaired according to common nursery practice and painted with tree paint.

(e) Restoration measures to be identified and designated on the environmental plans and specifications include the following: ground preparation, topsoiling, fertilizing, liming, reseeding, and replanting/replacement of trees and shrubs with native species. The aim of restoration is to restore the disturbed area to a condition as nearly equal to pre-disturbance condition as possible. The environmental specifications shall set forth the procedure for accomplishing these restoration measures. The plans shall include the location of various types of restoration and shall include details depicting typical methods to accomplish restoration. The provisions shall include the following, when applicable:

1. Final restoration shall be undertaken as soon as an area is no longer needed for construction, stockpiling or access. Excavated material unsuitable for backfill as set forth at N.J.A.C. 7:14-2.13 and considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be removed from the construction site and disposed of at a sanitary landfill approved and licensed by the Department. Excess excavated material which is not considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be graded or removed in accordance with (1)3 below. When access roads are no longer needed, road fill shall be removed and the access area shall be restored to pre-disturbance conditions. Care should be taken to avoid damage to adjacent vegetation and to prevent the formation of depressions that would serve as mosquito pools.

2. Topsoil shall be replaced with adequate amounts of topsoil material to restore the disturbed area to its original, pre-disturbance grade and depth of topsoil.

3. Rates and types of fertilization, liming, and seeding shall be as recommended by the local Soil Conservation District based on soil tests and local conditions. Seed mixtures shall be selected that are best suited for the particular site conditions. Seed selection shall provide for a quickly germinating initial growth, to prevent erosion, and for a secondary growth that will survive without continuing maintenance. Mulching shall occur immediately after seeding, and in no case shall more than five days elapse between seeding and mulching.

4. In wooded areas, for a 50-foot wide construction easement, generally 10 trees should be planted for every 100 feet of length of the easement. More trees would be required in wider easements or densely wooded areas. Plans shall include a restoration schedule specifying the quantity, common and botanic names, sizes, and spacing of trees to be planted and the type of seed mixtures to be used from station to station. Trees to be replaced should be trees native to New Jersey suitable for the particular site and generally should conform to the list of trees found in the "Standards for Soil Erosion and Sediment Control in New Jersey," prepared by the New Jersey State Soil Conservation Committee, 1999, incorporated herein by reference, as amended and supplemented.

5. In landscaped areas, environmental features shall be replaced or restored to pre-disturbance condition or better. This includes sodding, replacement of trees and shrubs, fences, drives, and other landscape features in kind.

(f) A listing of prohibited construction procedures shall be incorporated into the specifications. These procedures include, but are not limited to, the following:

1. Dumping of spoil material into any stream corridor, any wetlands, any vernal habitats, any surface waters, any sites listed or eligible for listing on the New Jersey or National Registers of Historic Places, or at unspecified locations;

2. Indiscriminate, arbitrary or capricious operation of equipment in any stream corridors, wetlands, vernal habitats, or surface waters;

3. Pumping of silt-laden water from trenches or other excavations into any surface waters, stream corridors, wetlands or vernal habitats;

4. Damaging vegetation adjacent to or outside of the access road or the right-of-way;

5. Disposal of trees, brush and other debris in any stream corridors, wetlands, vernal habitats, surface waters or at unspecified locations;

6. Permanent or unspecified alteration of the flow line of any stream;

7. Open burning of project debris;

8. Use of calcium chloride, petroleum products, or other chemicals for dust control;

9. Use of asphaltic mulch binder; and

10. Any unpermitted discharge of sewage.

(g) Construction in wetlands shall conform to the requirements of the New Jersey Freshwater Wetlands

This is a courtesy copy of this rule. All of the Department's rules are compiled in Title 7 of the New Jersey Administrative Code. The rule below includes the amendments adopted to this subchapter on January 3, 2006.

Protection Act, N.J.S.A. 13:9B-1 et seq., and N.J.A.C. 7:7A.

(h) Stream crossings shall conform to the requirements of the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq., and N.J.A.C. 7:13.

(i) Slopes exceeding 15 percent require special treatment. Specifications shall call for measures such as water diversion berms, sodding, or the use of jute or excelsior blankets. Hay bales shall be placed at the base of the slope prior to ground disturbance. Steep slopes that have been disturbed, if not sodded, shall be seeded and mulched immediately after construction is complete. Slope boards or other measures necessary to prevent slumping of the disturbed slope shall be incorporated, where appropriate.

(j) If there is the possibility of encountering acid-producing deposits in the course of construction, as identified during the planning process, special requirements and conditions will apply and shall be incorporated in the specifications as follows:

1. In vegetated areas, the top two feet of soil shall be stripped and stockpiled separately from the material to be excavated. A soils specialist, to be provided by the project sponsor, shall monitor the stripping operation. If any acid-producing deposits are identified, this material and any contaminated soil shall be disposed of on the same day. The presence of acid-producing deposits is detected by the use of the following tests:

i. Determining the pH of the soil when suspended in 0.5 Molar calcium chloride solution (of neutral pH). A pH value below 3.0 indicates presence of ferrous sulfate and presence of acid-producing deposits is strongly suspected.

ii. Test for sulfate by adding a drop of 10 percent barium chloride solution to a water extract of the material. If voluminous flocks of barium sulfate form immediately the presence of acid-producing deposits is strongly suspected.

2. The disposal site shall be approved by the Department. Any soil of this type disposed of shall be covered with a minimum of two feet of cover to prevent rapid oxidation and subsequent acid formation.

3. In both vegetated and paved areas, when acid-producing deposits are encountered, as determined by the soil specialist, excavated trench material shall be returned to the trench as follows:

i. Lower material first, followed by upper material.

ii. The top one to two inches of soil on which the deeper soil was stockpiled shall be scraped and placed below a depth of two feet.

iii. For pipeline construction, the quantity of material to be displaced by bedding and pipe, as well as soil scraped from the stockpile area, shall be subtracted from the deeper, excavated material and this quantity of deeper material removed to an approved disposal site and covered as described in (e)3 above.

iv. After backfilling the deeper soil, one ton of limestone per 2,000 square feet shall be spread over the deeper soil in the trench. This liming requirement is applicable in areas of well drained, nonsaturated soils, as determined by the soil specialist.

v. In vegetated areas, the top two feet of soil, stockpiled for this purpose, shall then be replaced. If the top two feet of soil was also contaminated, clean backfill material similar to the native topsoil shall be used in place of the contaminated material.

4. The excavated acid-producing deposits shall not be exposed for a period longer than eight hours. When acid-producing deposits are encountered, the trench opened in any construction day shall be backfilled and the areas cleaned up by the close of the day. Where this is impracticable, such as in the construction of pumping stations and treatment plants, exposed acid-producing deposits shall be covered with limestone screenings at a rate of 100 tons per acre and then covered with six inches of compacted soil within one week of exposure or before the exposed soil drops to pH 3, whichever occurs first. The pH shall be monitored daily under this procedure.

5. Temporary restoration of vegetated areas shall consist of mulching and shall be put in place at the end of each day's construction. Permanent restoration of the area shall begin as soon as construction is complete and after the results of incubation tests, where necessary, are available.

6. Prior to restoring vegetated areas, the soil specialist shall perform pH tests on the in-situ soil after the construction is completed. If the pH is below 4, intensive liming shall be required in order to make the soil suitable for plant survival.

7. Lime requirement tests shall be performed by the soil specialist to determine the lime application rates. This will require an incubation test in which the sample is oxidized for a period of six weeks, as follows:

i. The sample shall be air dried and ground so that the whole sample passes a 0.5 millimeter sieve.

ii. The lime requirement to reach pH 6.5 shall be determined initially, and again at two week intervals for six weeks, using standard soil testing techniques.

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iii. The total lime requirement determined by this method can be extrapolated to the area under consideration.

8. A minimum of 30 tons of limestone per acre or the amount of lime required according to the incubation test result shall be applied prior to seeding and planting where the pH is less than 4. Where the pH is greater than 4, liming and fertilizing requirements set out in the planting and environmental specifications shall apply.

9. The spreading and mixing of the subsoil and any topsoil contaminated with acid-producing deposits around the site and beyond the site is prohibited. Areas used for stockpiling acid-producing deposits shall be minimized. Equipment used for excavation and backfilling shall be cleaned, to the extent practicable, at the end of each day's operation and the soil removed shall be placed in the trench below a depth of two feet. No construction shall take place during significant rainstorms or while the area is saturated to avoid smearing or spreading of the acid-producing deposits over the area.

(k) When dewatering will occur and a dewatering permit is not required, the contractor shall monitor for adverse effects to structures or wells due to dewatering and shall be responsible to remedy same to the satisfaction of the Department. Discharges from dewatering activities which contain silt are subject to the following controls:

1. All discharges from dewatering activities to surface waters, wetlands, vernal habitats, or storm sewers shall be free of sediment. Care shall be taken not to damage or kill vegetation by excessive watering or by damaging silt accumulation in the discharge area. If discharges are sediment laden, techniques shall be employed to remove sediment prior to discharge. A sedimentation basin shall be constructed and used as specified, where necessary, to protect vegetation and to achieve environmental objectives.

2. Sewer inlets within construction areas shall be provided with perimeter hay bales or other appropriate siltation control measures.

(l) Contract requirements with regard to the location and control of stockpile, storage and disposal areas whether provided by the project sponsor or the contractor, must conform to the following:

1. Only environmentally suitable stockpile sites may be used for the purposes of staging or storing materials, equipment and suitable trench backfill material. Environmentally suitable sites must be level, and devoid of mature stands of natural vegetation. Drainage facilities and features, wetlands, vernal habitats, and stream corridors are not environmentally suitable sites.

2. The boundary of the stockpile area shall be clearly marked by hay bales, silt fencing or another appropriate method. Where fill is to be stored in excess of 10 days, a suitable means of protecting excavated material from wind and water erosion shall be employed. Erosion control methods may include one or more of the following: mulching, sprinkling, silt fencing, haybaling and stone covering.

3. Excess excavated material which is not considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be graded on-site only to the extent needed to achieve preconstruction grade, unless otherwise specifically approved by the Department. The project sponsor shall ensure that the contractor removes the remainder from the site and disposes of it at a site approved by the project sponsor in accordance with the following:

i. Disposal sites selected by the contractor shall be evaluated and approved by the project sponsor prior to their use. Disposal sites may also be selected by the project sponsor. The project sponsor shall conduct periodic inspection of disposal sites to ensure compliance with the requirements of this subsection during the off-site disposal operation.

ii. The disposal of excess excavated material in wetlands, vernal habitats, stream corridors and floodplains is strictly prohibited, even if the permission of the property owner is obtained. The contractor shall be responsible to remove any fill improperly placed by the contractor at the contractor's expense and restore the area impacted.

iii. If excess excavated material is placed on private property, a hold harmless release in favor of the project sponsor and the Department shall be obtained from the property owner; and

iv. Prior to approval of a site for excess excavated material disposal, where the site exceeds 5,000 square feet, the project sponsor shall obtain, or shall ensure that the contractor or property owner has obtained, the appropriate certification of the soil erosion and sediment control plan in accordance with the State's standards for soil conservation (N.J.S.A. 4:24-1 et seq., also referred to as Chapter 251). Where the site is less than 5,000 square feet, the project sponsor shall advise the property owner of the need for erosion and sediment control and obtain a statement that the property owner accepts complete responsibility for implementation of appropriate methods to prevent erosion and sedimentation.

(m) In order to control dust, as often as required during each working day, and particularly prior to the conclusion of each working day, areas under immediate construction (including access roads and other areas

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affected thereby) shall be swept and wet down with water sufficiently to lay dust. In addition, these areas shall be wet down during nonworking hours (including weekends) as often as required to keep the dust under control. The use of calcium chloride or petroleum products or other chemicals for dust control is prohibited.

(n) In order to limit noise impacts in the vicinity of sensitive receptors, construction operations and activities shall be limited as follows: Monday through Friday between the hours of 7:00 A.M. and 6:00 P.M. unless variances to these times are granted in times of emergency. No driving, pulling, or other operations entailing the use of vibratory hammers or compactors shall be permitted, other than between the hours of 8:00 A.M. and 5:00 P.M. The number of machines in operation at a given time shall be limited to the minimum practicable. All engine generators or pumps must have mufflers and be enclosed within a temporary structure.

(o) Provisions regarding the contractor's responsibility for cultural resource protection shall be included in contract documents that provide for the following:

1. If a cultural resource is encountered during the course of construction, the contractor is directed to halt all construction activities in that area. The contractor shall immediately contact the project sponsor who shall contact the Department. The Department will determine and require initiation of the appropriate actions in conformance with N.J.A.C. 7:22-10.8. .

2. The contractor shall not dispose of excess excavated material at, stockpile construction materials at, or obtain borrow material from, properties which are listed or eligible for listing on the New Jersey or National Registers of Historic Places.

(p) The project sponsor shall require that the contractor supply an environmental maintenance bond in the amount of \$25,000 or 50 percent of the price bid for the materials needed to fulfill the environmental specifications, whichever is greater. The environmental maintenance bond shall provide that the contractor shall remedy, without cost, any defects which result from faulty workmanship or from failure to comply with the specifications and which develop during the period of one year from the expiration of the performance bond required pursuant to N.J.S.A. 40A:11-22.

(q) The project sponsor shall obtain photographs of existing conditions prior to the start of site and access clearing and construction. At a minimum, one eight inch by 10 inch color glossy print photograph shall be obtained for each 100 feet of the construction area. Special attention shall be given to environmentally critical areas and areas outside of the public right-of-way. Photographs shall be labeled by station so that upon completion of the construction, or during construction if necessary, subsequent photographs can be taken from the same control points. The project sponsor shall file copies of the above photographs with the Department. As a supplement to the required photographs, video documentation may be submitted to the Department, and is encouraged as a way of documenting site conditions.

7:22-10.12 Construction phase requirements

(a) The project sponsor must employ one, or more if warranted by the scope of the project, environmental inspector(s) to ensure that the requirements of the specifications relating to environmental and cultural resource protection and restoration are effectively carried out. Individuals designated as environmental inspectors by the project sponsor must possess, at a minimum, the education/experience qualifications of an Environmental Specialist employed with the Department. The Department will also conduct environmental inspections to oversee the conduct of the protection/restoration measures. Responsibilities of the project sponsor's environmental inspector(s) include the following:

1. Daily inspections of active work areas and periodic inspection of maintenance or restoration areas sufficient to ensure performance of protection measures in accordance with contract documents.

2. The maintenance of a daily job diary in which they shall record the progress of the work and of any problems encountered. The environmental inspectors shall notify the contractor in writing immediately upon noticing that environmental specifications are not being met.

3. At frequent intervals during construction, the recipient, the resident engineer, the environmental inspectors and the Department inspectors shall meet to review progress and to resolve difficulties that might result in unnecessary delays in the work. The Department shall notify the recipient if deficiencies are not immediately corrected. The recipient shall then direct compliance with environmental requirements.

(b) After award of a contract and before construction commences, a pre-construction conference shall be held. The recipient, the resident engineer, the environmental inspectors, the Department inspectors and the contractor should reach general agreement upon procedures to be followed to comply with the plans and

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specifications intended to provide environmental and cultural resource protection and restoration that have been approved by the Department.

(c) A final inspection shall be required following completion of all construction and restoration work encompassed by each contract. The final inspection shall be conducted as follows:

1. Upon completion of all construction and restoration work of each contract of a project, the recipient shall submit a letter to the Department stating that the project (or contract) is ready for final inspection. No final inspection can be scheduled until formal notification is received.

2. The final inspection shall be a joint inspection with the recipient and/or the resident engineer, the environmental inspector, the contractor and representatives from the Department in attendance.

(d) The Department shall make periodic determinations and, following the final inspection, make a final determination regarding the adequacy of the contractor's performance of the specifications relative to environmental and cultural resource protection and restoration. If the performance is not acceptable, this finding and the procedures and schedules needed to effect acceptable performance will be conveyed in writing to the project sponsor. Failure of the project sponsor to comply with the Department's requirements may subject the project sponsor to the noncompliance provisions of N.J.A.C. 7:22-3.40, 4.40 and 6.40 and N.J.A.C. 7:22A-1.8.

EXHIBIT NO. 6

**SED PARTICIPATION BUILDING PHASE QUARTERLY REPORT
(FORM OEO-002)**

**OFFICE OF EQUAL OPPORTUNITY
AND
PUBLIC CONTRACT ASSISTANCE**

**MUNICIPAL FINANCE
AND
CONSTRUCTION ELEMENT**

SED PARTICIPATION

BUILDING PHASE

QUARTERLY REPORTING FORM

FOR

CONTRACTING AGENCIES & CONTRACTORS

(OEO-002)

New Jersey Department of Environmental Protection

REPORTING REQUIREMENTS ON SOCIALLY AND ECONOMICALLY DISADVANTAGED (SED) BUSINESS UTILIZATION

These instructions apply to reporting on the utilization of Socially and Economically Disadvantaged Businesses (MBEs/WBEs/SEDs) under the New Jersey Department of Environmental Protection and the New Jersey Environmental Infrastructure Financing Programs. They are intended to provide guidance to Project Sponsors and Contractors in filling out the Building Phase (SED) Utilization Form. The reporting requirements apply to all Contracting Agencies and Contractors pursuing New Jersey Financing Assistance through programs administered by the New Jersey Department of Environmental Protection and the New Jersey Environmental Infrastructure Trust pursuant to N.J.A.C. 7:22-3.; N.J.A.C. 7:22-4.; N.J.A.C. 7:22-6; N.J.A.C. 7:22A-6; N.J.A.C. 7:22-7.

Each Project Sponsor and Contractor must submit this building SED Report (Form OEO-002) quarterly on MBE/WBE utilization for each contract for which a Project Sponsor or its Contractor(s) awards a subagreement. The form must be submitted to the New Jersey Department of Environmental Protection (NJDEP), Office of Equal Opportunity, Public Contract Assistance within 15 days following the close of each fiscal year quarter (i.e., January 15, April 15, July 15, and October 15).

INSTRUCTIONS FOR FILLING OUT SED UTILIZATION REPORT

1. Read instructions carefully before completing form, and refer to N.J.A.C. 7:22-9.1 et seq. for further guidance.
- 2a. The name and address of Project Sponsor participating in the grant/loan programs for environmental infrastructure facilities.
- 2b. Name of the Project Compliance Officer responsible for submitting periodic reports.
3. Name and address of party contracting directly with the Project Sponsor.
4. Self-explanatory.
- 5a. The grant/loan project number for the agreement between the State of New Jersey and the Project Sponsor.
- 5b. The grant/loan project number for the contract between the Project Sponsor and its contractor(s).
6. Include brief description of project.
7. Self-explanatory.
- 8a. The county in which the Project Sponsor is located.
- 8b. The municipality in which the Project Sponsor is located.
9. The date of the agreement between the State of New Jersey and the Project Sponsor.
- 10a. The date of agreement between the Project Sponsor and the contractor.
- 10b. Self-explanatory.
11. Indicate MBE and WBE goals based upon project plan for SED utilization developed in consultation with the Office. These goals may vary depending upon local law. Where a Project Sponsor has a SED participation goal which exceeds ten percent, the Project Sponsor's goal shall take precedence.
12. Enter the name, address and telephone number of each SED participating in the building phase as a subcontractor under agreement with the construction management firm or the Project Sponsor. Check applicable MBE or WBE status of each listed SED. Explain type of service rendered and list the total dollar amount of the subcontract. Each entry must be accompanied by a copy of the signed subcontract.

Restricted - Bids may be solicited on a restricted basis by setting aside a contract for building, materials and equipment, or services which is designated as a contract for which bids are invited and accepted only from SEDs.

Unrestricted - Bids may be solicited on an unrestricted basis and not designated for a set-aside contract, but the contract document shall include a statement to the effect that the successful bidder must fulfill the SED utilization requirements.

- 13. See instructions for Item 12. This section is designated for SEDs participating in the building phase of a project as a subcontractor under agreement with building contractor(s).
- 14. Person signing must be the designated Project Compliance Officer of the Project Sponsor. The contractor(s) or the authorized representative of the contractor(s).
- 15. Additional comments or explanations. Refer to the specific item number on the form, if applicable.

OEO-002

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
 NEW JERSEY MUNICIPAL FINANCE & CONSTRUCTION ELEMENT
 OFFICE OF EQUAL OPPORTUNITY & PUBLIC CONTRACT ASSISTANCE

CONSTRUCTION REPORT

SOCIALLY AND ECONOMICALLY DISADVANTAGED (SED) BUSINESS UTILIZATION

1. *Read Instructions Before Completing Form.*

2a. Project Sponsor

Name

Address

2b. Project Compliance Officer _____

3. Contractor

Name

Address

4. Financing Program (check applicable program(s))

____ a. Wastewater Treatment Fund ____ b. Wastewater Treatment Trust ____ c. Pinelands Infrastructure Trust

____ d. Stormwater Management ____ e. Water Supply

5a. Project Number _____

5b. Contract Number _____

6. Project

Name _____

7. Contract Amount \$ _____

8a. County _____

8b. Municipality _____

9. Date of Grant/Loan Agreement _____

10a. Date of Contract Award _____ 10b. Duration of Contract: Mo. _____ Days _____

11. STATE GOAL OR OTHER STANDARDS (IF ANY)

Contracting Agency=s Requirement

	<u>DOLLAR AMOUNT</u>	<u>PERCENTAGE OF CONTRACT AMOUNT</u>
MBE	\$ _____	_____ %
WBE	\$ _____	_____ %
TOTAL SED	\$ _____	_____ %

12. A/E and Other Professional Service Subcontracts Awarded During the Building Phase

Name, Address and Telephone No.	WBE	MBE/	Type of Service Rendered	Amount	Dollar Number	Award	Subcontract (R/U)	Subcontract	Date of Subcontract	Type of Award*
1. _____ _____ _____										
Number of Full-time Employees										
2. _____ _____ _____										
Number of Full-time Employees										
3. _____ _____ _____										
Number of Full-time Employees										
4. _____ _____ _____										
Number of Full-time Employees										
5. _____ _____ _____										
Number of Full-time Employees										
6. _____ _____ _____										
Number of Full-time Employees										

* Restricted/Unrestricted

13. Other Subcontract Awards Made Under the Building Phase

Name, Address and Telephone No.	WBE	MBE/	Type of Service Rendered	Amount	Dollar Number Amount Award	Subcontract (R/U)	Subcontract	Date of Subcontract	Type of Award*
1. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees		_____							
2. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees		_____							
3. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees		_____							
4. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees		_____							
5. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees		_____							
6. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees		_____							

* Restricted/Unrestricted



(Signature of Project Compliance Officer)

(Signature of Contractor)

(Title)

(Title)

(Date)

(Date)

15. Space Provided for Additional Comments or Explanations



EXHIBIT NO. 7

**SED PARTICIPATION MONTHLY PROGRESS REPORT
(FORM OEO-003)**

**OFFICE OF EQUAL OPPORTUNITY
AND
PUBLIC CONTRACT ASSISTANCE**

**MUNICIPAL FINANCE
AND
CONSTRUCTION ELEMENT**

SED PARTICIPATION

MONTHLY PROGRESS REPORT
(OEO-003)

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION SED UTILIZATION IN ENVIRONMENTAL INFRASTRUCTURE FINANCING PROGRAM

MONTHLY PROGRESS REPORT

Contractor _____

Project Number _____

Project Name _____

Contract Amount _____

Report Month/Year _____

The following information is required in order to assist the Project Compliance Officer and the New Jersey Department of Environmental Protection in monitoring the SED (small business enterprises owned and controlled by socially and economically disadvantaged individuals) Utilization progress and activity in the Environmental Infrastructure Financing Program. Each contractor shall respond to each of the listed items. Whenever evidence of completion of each item is available, copies of itemized documents are to be submitted to the Project Compliance Officer.

Over the past month has any action on any item taken place? Please explain each.

- | | | |
|--|-----------|----------|
| 1. Copies of Solicitation to SED=s | _____ Yes | _____ No |
| 2. Advertisement of bidding or procurement opportunities | _____ Yes | _____ No |
| 3. Evidence of negotiation with SEDs | _____ Yes | _____ No |
| 4. Copies of telephone quotes/negotiations | _____ Yes | _____ No |
| 5. Copies of signed subagreements | _____ Yes | _____ No |
| 6. Have any subcontracts been awarded in the past month | _____ Yes | _____ No |

Please provide an explanation for Questions 1 through 6.

Signature of Contractor

Signature of Project Compliance Officer

Date

Date

EXHIBIT NO. 8

PVSC SED UTILIZATION PLAN

Passaic Valley Sewerage Commission (PVSC)

Socially and Economically Disadvantaged Utilization Plan

Introduction

It is the policy of the PVSC to promote award of contracts to Socially and Economically Disadvantaged (SED) small business enterprises by stipulating specific requirements for involving such businesses in contracting. The failure of the Contractor to demonstrate a good faith effort to achieve the goals set forth herein by utilizing best efforts to implement the SED utilization plan will constitute an event of default of the Agreement. PVSC shall designate a compliance officer who shall be responsible for coordinating SED utilization efforts for the Agreement and for monitoring compliance with the plan. PVSC reserves the right to audit the Contractor's SED records to insure compliance with this provision. Socially and economically disadvantaged businesses definitions and associated terms are defined in the NJAC 7:22-9.2.

SED's Scope and Purpose

The goal is established at 10% SED (combined MBE/WBE) participation. Fulfillment of the goal can be achieved through lower tier agreements with SEDs for services, supplies or construction necessary to complete the project. The Contractor must endeavor to meet the goal specified in the previous paragraph by taking and documenting the following affirmative steps to ensure that the SED businesses are used as sources of services, supplies or construction whenever possible by:

1. Placing SEDs on solicitation lists.
2. Assuring SED solicitation whenever they are potential sources.
3. Encouraging SED participation through the division of total requirements, when economically feasible, into smaller tasks or quantities.
4. Encouraging SED participation through the establishment of delivery schedules, where the work requirement permits.
5. Using the services and assistance of the Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and the N.J. Department of Commerce and Economic Development, Division of Development for Businesses and Women and Minority Businesses.

When soliciting services from subcontractors, the Contractor must include the 10% goal in its Proposals. Contract work cannot commence until the PVSC has approved the Contractor's SED Utilization Plan.

Definitions

Definitions are incorporated herein by reference and can be found at N.J.A.C 7:22-9.2.

In-House Procedures

The Project Compliance Officer, or his designee, shall be responsible for coordinating' SED utilization efforts on the project, for monitoring and enforcing compliance with the affirmative action and the SED requirement.

SED utilization requirements shall be an agenda item at all contract award meetings and, wherever applicable, at preconstruction conference meetings regardless of whether a loan or grant agreement has been executed or not. Each project sponsor shall be responsible for notifying the Office of the time and place of such meetings.

The project compliance officer, or his designee, shall attend all monthly construction progress meetings. .

State of New Jersey SED Certification Requirement

Any SED firm proposed by the Contractor must be certified by a certifying agency in the State of New Jersey or be certifiable and pending certification, as verified by PVSC, in order to qualify toward the firm's fair share goals. Other certifications may be deemed acceptable, as approved by PVSC on a case by case basis.

For information purposes only, the State of New Jersey Department of Commerce and Economic Development Division of Development and Small Business and Women Minority Businesses Set Aside and Certification office maintains a state wide Certification Directory containing a list of SEDs who are accepted as such by the State of New Jersey and who might be interested in becoming suppliers or subcontractors for this contract.

SED Utilization Plan Requirements

Thirty (30) days after Notice of Award, the contractor must submit an approvable SED Utilization Plan to the PVSC. To be approvable, the SED Utilization Plan for subcontractors, suppliers and construction, must detail the steps taken or be taken by the Contractor to provide for SED utilization for the total fair share percentage established by the Agreement. It must further provide documentation to evidence the Contractor's efforts to date and planned efforts toward achieving the goal.

SED Utilization Plan Revisions

If a SED supply, service, or subcontract in the approved plan will not be procured, the Contractor must amend the plan. The Contractor must demonstrate a good faith effort to comply with the fair share percentage established in the Agreement by submitting documentation outlining the SED affirmative steps taken and the reasons for not engaging the SED. The Contractor must further revise the SED plan to detail the additional steps to be taken to reach the SED participation goal set forth herein as part of the required SED Utilization Plan Revision.

EXHIBIT NO. 9

NJAC 7:14-2

N.J.A.C. 7:14

WATER POLLUTION CONTROL ACT

Statutory authority: N.J.S.A. 13:1B-3 et seq., 13:1D-1 et seq., 13:1E-1 et seq., 58:10-23.11 et seq., 58:10A-1 et seq., 58:11-49 et seq., 58:11A-1 et seq. and 58:12A-1 et seq.

Date last amended: October 5, 2010

For regulatory history and effective dates, see the New Jersey Administrative Code

Table of Contents

SUBCHAPTER 1. (RESERVED)

SUBCHAPTER 2. CONSTRUCTION OF WASTEWATER TREATMENT FACILITIES

7:14-2.1	Construction procedures
7:14-2.2	Record drawings; collector sewers, interceptor sewers and force mains
7:14-2.3	Permits
7:14-2.4	Easements/rights-of-way
7:14-2.5	Field layout (baseline and monuments)
7:14-2.6	Engineer design activities: plan scale and plan updating
7:14-2.7	Construction, overhead and profit factors for Extra Work compensation
7:14-2.8	Payments to contractors
7:14-2.9	Mobilization: unit price contracts for sewer construction
7:14-2.10	Bid items for sewer pipe installation
7:14-2.11	Reasonable minimum unit prices
7:14-2.12	Payment widths, trench backfill and roadway paving for Federally funded sewer projects
7:14-2.13	Excavation material unacceptable or conditionally acceptable for reuse as trench backfill
7:14-2.14	Construction equipment costs compensation for extra work
7:14-2.15	Substantial and final completion of pipe projects; contractor's guarantees

SUBCHAPTERS 3 THROUGH 7. (RESERVED)

SUBCHAPTER 8. CIVIL ADMINISTRATIVE PENALTIES AND REQUESTS FOR ADJUDICATORY HEARINGS

7:14-8.1	Authority and purpose
7:14-8.2	Definitions
7:14-8.3	Procedures for assessment, payment and settlement of civil administrative penalties, and affirmative defenses
7:14-8.3A	Public comment on interim enforcement limits
7:14-8.4	Procedures to request an adjudicatory hearing to contest an administrative order, a notice of civil administrative penalty assessment or a notice of civil administrative cost assessment; procedures for conducting adjudicatory hearings
7:14-8.4A	Grace period applicability; procedures
7:14-8.5	Civil administrative penalty determination
7:14-8.6	Civil administrative penalty for submitting inaccurate or false information
7:14-8.7	Civil administrative penalty for failure to allow lawful entry and inspection
7:14-8.8	Civil administrative penalty for conducting unapproved activities
7:14-8.9	Civil administrative penalty for failure to properly conduct monitoring or sampling under the Water Pollution Control Act
7:14-8.10	Civil administrative penalty for failure to pay a fee
7:14-8.11	(Reserved)

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- 7:14-8.12 Civil administrative penalty for violation of whole effluent toxicity limitations
- 7:14-8.13 Civil administrative penalty for economic benefit
- 7:14-8.14 Civil administrative penalty for failing to comply with an information request or administrative subpoena, and the destruction of records
- 7:14-8.15 (Reserved)
- 7:14-8.16 Civil administrative penalty determination for indirect dischargers
- 7:14-8.17 Enforcement actions for failure to implement an approved industrial pretreatment program
- 7:14-8.18 Tables of minor and non-minor violations; grace periods
- 7:14-8.19 Severability

APPENDIX A. WORDING OF FINANCIAL ASSURANCE DOCUMENTS

APPENDIX A-1 THROUGH B-2 (RESERVED)

APPENDIX B-3. POLLUTANTS THAT ARE INHIBITORY TO BIOLOGICAL TREATMENT PROCESSES

APPENDIX C THROUGH D (RESERVED)

SUBCHAPTER 1. (RESERVED)

SUBCHAPTER 2. CONSTRUCTION OF WASTEWATER TREATMENT FACILITIES

7:14-2.1 Construction procedures

The Department shall require and adhere to the procedures identified in this subchapter. Actions or procedures by owners, permittees, consultants, contractors, or other persons affected by this subchapter which are not in accordance with this subchapter shall not be acceptable to the Department. Where applicable, the Department may grant a waiver from any requirement of this subchapter upon presentation of written justification by the owner, permittee, consultant or contractor.

7:14-2.2 Record drawings; collector sewers, interceptor sewers and force mains

(a) The owner shall be responsible for the preparation of all record drawings required for sewer lines. This responsibility may be delegated to the owner's representative with adequate compensation for this service.

(b) This responsibility shall not be delegated or transferred to the contractor. The contractor shall assist the owner/engineer, by providing record information, when requested, during the progress of the work.

7:14-2.3 Permits

(a) Federal, State, county and municipal permits required as a result of the construction activity within the delineated site shall be obtained by the owner and associated fees shall be paid by the owner. In addition, permits required for construction activities on railroad properties shall be obtained by the owner.

(b) Exceptions to this section shall be a permit to use explosives for rock excavation and such other permits which by law are required to be obtained by the contractor.

(c) The owner shall make every reasonable effort to identify permits and fees and costs required as a result of the construction activity in effect 60 days prior to the receipt of construction bids. This responsibility may be delegated to the owner's engineer with adequate compensation for this service. The engineer shall be held harmless from any pen-

alty or action resulting from the failure to obtain a permit where every reasonable effort has been made by the engineer to obtain such permits. Conditions made a part of any permit shall be imposed upon the contractor as described in the contract or bid documents. Additional costs associated with a permit resulting from the construction activity which is beyond that stipulated in the contract shall be the responsibility of the contractor.

(d) Whenever necessary or appropriate the contractor shall assist the owner in the acquisition of permits.

(e) The Department may intercede and assist in the resolution of any problems resulting from the acquisition of any permits.

7:14-2.4 Easements/rights-of-way

An interruption of construction or an extension of contract time may be a basis for a claim by a contractor for additional cost when such interruption or extension is caused by the owner's inability to obtain an easement/right-of-way. Claims shall include any reasonable cost incurred by the contractor and shall be reviewed and approved by the owner prior to submission to the Department. The Department may approve all, any portion, or deny the cost for eligibility for projects funded under the Grant Program.

7:14-2.5 Field layout (baseline and monuments)

The owner shall be responsible to establish and confirm field controls prior to start of construction. The contractor shall not be liable to check the accuracy of field controls (baseline and monuments) for sewer pipe installation. However, the contractor's layout must be based on a minimum of two field control points. Whenever the contractor detects an error in the field controls during pipe installation, the contractor shall immediately notify the owner and the owner's engineer of such error with sufficient documentation. The contractor shall be held responsible for all corrective measures and associated costs for failure to notify the owner of such error.

7:14-2.6 Engineer design activities: plan scale and plan updating

(a) On occasion, projects do not go to construction within a reasonable time after the bid advertisement. During this period, utilities may be relocated or installed, as well as other changes which can take place that are unknown to the contractor. Because of this, problems can take place during construction and result in numerous change orders and increases in the cost of the project.

(b) The horizontal scale for construction plans for sewerage facilities shall not be less than one inch equals 100 feet. A larger horizontal scale shall be used where appropriate to show sufficient detail to construct the project. The vertical scale for construction plans for sewerage facilities shall be not less than one inch equals 10 feet. Based upon the best information available, the location of underground utilities and support structures for overhead utilities shall be shown on the plans.

(c) Construction plans for sewerage facilities shall be updated whenever the bid advertisement date exceeds one year after approval by the responsible State or Federal regulatory agency. The engineer shall receive adequate compensation for updating plans and specifications. All such revisions shall be noted and dated on the plans prior to bid.

7:14-2.7 Construction, overhead and profit factors for Extra Work compensation

(a) The contractor is entitled to all identifiable direct job costs associated with Extra Work excluding subcontractor's costs. For Extra Work not in excess of \$ 10,000 the contractors may add up to 10 percent overhead factor to their identifiable direct job costs, but excluding the cost of any subcontracting, plus up to a 10 percent profit factor to their identifiable direct costs plus overhead amount.

(b) As general policy, these overhead and profit factors may be accepted by owners as reasonable in lieu of requiring the submission of additional supporting data. However, the owner must reserve its right to review any cost or profit element on a case-by-case basis, where the submission for overhead and profit is in excess of the 10 percent overhead and 10 percent profit indicated above.

(c) Cost increase in subcontracted work may be similarly handled and a prime contractor may add up to 10 percent to the total cost (including overhead and profit factors) incurred by the subcontractor. In such cases, the same reservations for rights shall apply.

(d) For Extra Work in the amount of \$ 10,000 to \$ 100,000, the above factors may be included initially for equitable adjustments but will be subject to negotiation, cost and pricing data, and owner review requirements. Federally funded projects will be governed by Federal regulations.

7:14-2.8 Payments to contractors

(a) At least 20 days before each monthly progress payment falls due for approval (but not more often than once per month), the contractor will submit to the engineer a partial payment estimate filled out and signed by the contractor covering the work performed during the period covered by the partial payment estimate and supported by such data as the engineer may reasonably require. Where any specific item(s) in the partial payment estimate is in dispute, the engineer may delete those costs from the estimate and approve the acceptable portion of the payment request. Payment requested for stored materials and/or equipment shall be subject to the following conditions being met or satisfied:

1. The materials and/or equipment shall be received in a condition satisfactory for incorporation in the work.
2. The materials and/or equipment shall be stored in such manner that they will not be damaged due to weather, construction operations or any other cause.
3. An invoice from the supplier shall be furnished for each item on which payment is requested.
4. The contractor shall furnish written proof from the supplier of 90 percent payment for the materials and/or equipment no later than 30 days after receipt of payment for same from the owner. The owner shall have the right to deduct from the next payment estimate an amount equal to the payment for said material and/or equipment if reasonable and adequate proof is not submitted.

(b) The contractor warrants and guarantees that title to all work, materials, and equipment covered by an Application for Payment, whether incorporated in the project or not, will pass to the owner upon the receipt of such payment by the contractor free and clear of all lien, claims, security interests or encumbrances (except 10 percent retention which may be withheld from suppliers and subcontractors to guarantee completion and performance). The engineer will after receipt of each partial payment estimate either indicate in writing his approval of payment and present the partial payment estimate to the owner, or return the partial payment estimate to the contractor indicating in writing his reasons for refusing to approve payment. In the latter case, the contractor may make the necessary corrections and resubmit the partial payment estimate. The owner shall review the partial payment estimate at its next regularly scheduled meeting and, if approved, payment shall be made available to the contractor within five days. The owner shall retain not more than two percent of the amount of each payment claimed. In accordance with EPA regulations, prime contractors are also required to make prompt payment to subcontractors and suppliers for eligible construction, material, and equipment costs. Generally, payments of all valid subcontractor and supplier requests for payment should be satisfied prior to the next succeeding request for progress payment by the prime contractor.

(c) When the work is substantially complete (Operational or Beneficial Occupancy), the withheld amount shall be further reduced below two percent but not less than twice the current market value of the work yet to be completed. On completion and acceptance of a part of the work on which the price is stated separately in the Contract Documents, payment shall be made in full including retained percentages, less authorized deductions. The contractor or owner may request assistance and guidance from the Department on disputes regarding retainage.

(d) "Substantial completion" as used in the context of this section shall mean satisfactory completion of major portions of the contract work, including inspection and testing, so that the facility may be turned over to the owner for its intended use or occupancy. The engineer shall certify the date of substantial completion and that date shall establish the beginning date of the warranty/guarantee period unless a prior date has been established.

7:14-2.9 Mobilization: unit price contracts for sewer construction

(a) Mobilization shall consist of the cost of initiating the contract. Payment for mobilization will be made at the lump sum price bid for this item in the proposal, which price shall include the cost of initiating the contract. The provisions for payment for the item mobilization supersede any provisions elsewhere in the specifications for including the costs of

these initial services and facilities in the prices bid for the various items scheduled in the proposal. The lump sum price bid for mobilization shall be payable to the contractor whenever he shall have completed 10 percent of the work of the contract. For the purposes of this item, 10 percent of the work shall be considered completed when the total of payments earned, exclusive of the amount bid for this item, shown on the monthly certificates of the approximate quantities of work done, shall exceed 10 percent of the total price bid for the contract.

(b) The lump sum price bid for mobilization is limited to the following maximum amounts:

From More Than	Original Contract Amount (including Mobilization) To and Including	Maximum Amount for Item of Mobilization
\$ 0	\$ 100,000	\$ 3,000
100,000	500,000	15,000
500,000	1,000,000	30,000
1,000,000	2,000,000	60,000
2,000,000	3,000,000	90,000
3,000,000	4,000,000	120,000
4,000,000	5,000,000	125,000
5,000,000	6,000,000	150,000
6,000,000	7,000,000	175,000
7,000,000	10,000,000	200,000
10,000,000	--	2.5% of Amount Bid

7:14-2.10 Bid items for sewer pipe installation

(a) This section establishes bid items which shall be included in unit price contracts for sewer pipe installation where applicable.

Description	Unit of Measure
1. Test Pits	Cubic Yard
2. Stone Foundation (bedding)	Cubic Yard
3. Select Material (below and above pipe grade)	Cubic Yard
4. Rock Excavation (including removal and disposal of boulders)	Cubic Yard
5. Wood Sheeting (install and remove where shown on plans)	Square Feet or 1000 Board Feet
6. Wood Sheeting (left in place where shown on plans)	Square Feet or 1000 Board Feet
7. Steel Sheeting (install and remove where shown on plans)	Square Feet or Tons
8. Steel Sheeting (left in place where shown on plans)	Square Feet or Tons
9. Permanent Pavement Gravel	Square Yard
10. Pavement	
i. Municipal:	
(1) Temporary which shall be removed (where applicable)	Square Yard
(2) Base	Square Yard
(3) Top	Square Yard
ii. County:	
(1) Temporary which shall be removed (where applicable)	Square Yard
(2) Base	Square Yard
(3) Top	Square Yard
iii. State:	
(1) Temporary which shall be removed (where applicable)	Square Yard

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	(2)	Base		Square Yard
	(3)	Top		Square Yard
11.		Testing	Linear Feet	
12.		Concrete Cradle or Encasement (to be identified where applicable)	Cubic Yard	

7:14-2.11 Reasonable minimum unit prices

(a) This section establishes reasonable minimum unit prices for indeterminate items, where applicable, for sewer pipe installation. Indeterminate items are those items which may be anticipated and for which quantities cannot be determined.

(b) The reasonable minimum unit prices are to be established by the owner/engineer for the following items:

1. Stone Foundation;
2. Select Material;
3. Concrete Cradle or Encasement--Nonreinforced;
4. Concrete Cradle or Encasement--Reinforced;
5. Test Pits;
6. Rock Excavation;
7. Wood Sheeting (install and remove)--square feet or 1000 board feet;
8. Wood Sheeting (left in place)--square feet or 1000 board feet;
9. Steel Sheeting (install and remove)--square feet or tons;
10. Steel Sheeting (left in place)--square feet or tons.

7:14-2.12 Payment widths, trench backfill and roadway paving for Federally funded sewer projects

(a) This section establishes eligible payment widths for select fill used for trench backfill and roadway pavement for federally funded sewer projects.

(b) Select trench backfill payment width:

1. Select trench backfill will be eligible for grant funding when the excavated material is totally or partially unacceptable for reuse as trench backfill. When the unacceptable material must be replaced with approved select backfill in a trench with a depth of 10 feet or less from the top of the pipe, the eligible payment width shall be Bd as shown below. For trenches of a greater depth the maximum eligible payment width shall be Bd plus H for the depth of unsuitable material as measured at the time of excavation.

2. When trench width is less than Bd plus H, the actual width shall control the payment.



3. Bd equals Maximum trench width (measured at the top of the pipe) allowed by the engineer for the type and strength class of pipe being installed.

4. The owner/engineer must make every effort to minimize the use of select fill. Marginal backfill material (material which is not acceptable for use in the pipe envelope or as a subbase for roadways) will be limited to the midzone of the trench. The midzone is defined as that portion of the trench beginning two feet above the top of the pipe, after compaction of the pipe envelope, to a point two feet below the final road or easement elevation. The owner/engineer must make all final decisions concerning the above.

(c) Paving:

1. Maximum eligible payment width shall be the disturbed width plus two feet. In no case shall the maximum eligible payment width be greater than Bd plus H ;



2. Maximum Eligible Pay Width equals Bd plus H ;

3. Special considerations:

i. Pavement replacement shall, in all instances, be "like kind" replacement except where the replacement of the original thickness of roadway material will not yield a structurally stable surface over the disturbed trench area, or where the requirements of the responsible governmental jurisdiction specify roadway materials other than the original disturbed pavement. In these instances, the engineer should specify the minimum thickness necessary to obtain a structurally sound surface or to comply with established local, county or State road opening permit requirements. Such requirements shall be contained in the contract documents.

ii. Roadways where the original total pavement thickness is less than two inches and the pavement cannot be boxed and maintained during construction, will be eligible for "like kind" replacement outside of the eligible trench pavement width.

iii. Any deviation from the above should be submitted during the design phase (Step II) for approval if possible. In all instances, approvals must be obtained prior to soliciting bids.

iv. Reducing the pavement thickness specified by the engineer and spreading it across a wider area of the street will not be approved unless extenuating circumstances justify the need to pave a wider area. These situations will be considered on a case by case basis and must be submitted as a Change Order and receive approval prior to implementing such a change.

(d) Application of this section is mandatory for all Federal Grants awarded to projects, pursuant to the provisions of the Federal Clean Water Act (33 U.S.C. §§ 1251 et seq.) as amended, before October 1, 1998. For all Federal Grants awarded after October 1, 1998, the allowable costs shall be determined in accordance with the applicable provisions of the Financial Assistance Programs for Environmental Infrastructure Facilities rules at N.J.A.C. 7:22-5, Determination of Allowable Costs: Fund and Trust.

7:14-2.13 Excavation material unacceptable or conditionally acceptable for reuse as trench backfill

(a) The following trench excavation materials are unacceptable as trench backfill:

1. Any excavation materials that will cause damage to the piping systems;
2. Any excavation material that cannot be compacted or consolidated to yield the desired density as specified in the contract specifications;
3. Trees, stumps and foreign material.

(b) The following excavation materials are conditionally acceptable as trench backfill only if provided for in the contract specifications and the trench is located in a right-of-way, an easement, a roadway or an unimproved area:

1. Clay, organics and silt determined to be suitable in accordance with soil tests required by the owner/engineer.
2. Hard materials, such as blacktop, concrete, stone and rock.
 - i. The hard materials shall only be placed in the midzone of the trench beginning two feet above the top of the pipe, after compaction of the pipe envelope, to a point two feet below the final road or ground surface.
 - ii. Placement of the hard materials shall not create a potential hazard to the pipe or create voids that will cause adverse settlement.
- iii. The maximum overall size of any piece of hard material shall be 12 inches.

(c) The Department may require that all trench backfill material not conforming to this subsection and contract specifications be removed and spoiled to a spoil site approved by the Department in accordance with the requirements of N.J.A.C. 7:26-1, for solid or hazardous wastes.

7:14-2.14 Construction equipment costs compensation for extra work

(a) The contractor is entitled to all identifiable direct job equipment costs associated with extra work. The compensable cost for construction equipment shall be based upon the most current costs established in "Rental Rates for Construction Equipment" and "Rental Rates for Older Construction Equipment" (Blue Book), Dataquest Incorporated, A.C. Nielsen Company, San Jose, CA, 1983.

(b) Overhead and profits factors allowed in N.J.A.C. 7:14-2.7, shall only be applied to the rates charged for rental equipment used by the contractor for extra work.

7:14-2.15 Substantial and final completion of pipe projects; contractor's guarantees

(a) The contractor shall notify the owner/engineer in writing when the contract work is substantially complete as defined by N.J.A.C. 7:14-2.8(d). Within a reasonable time, the owner/engineer shall inspect the work.

(b) If the owner/engineer considers the work to be substantially complete, and before the Certificate of Substantial Completion is issued, the contractor shall:

1. Submit a construction schedule for the remaining work to be completed, and
2. Warrant and guarantee, for a period of one year or for a period as otherwise specified, from the date of Substantial Completion, that the completed work is free from defects due to faulty materials, equipment or workmanship. The Performance Bond shall remain in effect through the guarantee period.

(c) If the owner/engineer does not consider the work to be substantially complete, the engineer shall notify the contractor in writing, listing the items to be completed or corrected.

1. The contractor shall correct or complete items identified in writing within a reasonable time as specified in the contract documents, including repairs of any damage resulting from such defects to other work completed under the contract.

2. If the contractor fails to make such corrections within a reasonable time as specified in the contract documents, the owner may do so and charge the costs incurred, including direct and indirect costs, to the contractor.

(e) Before the Contractor has received notification of substantial completion, the owner/engineer may submit a request to the contractor to use a functional portion of the work if:

1. Such use does not significantly interfere with construction on any portion of remaining work to be completed, and

2. The conditions of such use shall be identified in the Certificate of Substantial Completion when issued by the owner/engineer.

(f) Final completion shall be that point at which the contract is completed, defective work corrected and clean up work accomplished. Unless a Certificate of Substantial Completion has been issued, the guarantee period shall begin upon certification of final completion by the engineer.

Subchapters 3 through 7. (RESERVED)

EXHIBIT NO. 10

NJSA 2A:44-143, 144

(UPDATED THROUGH P.L. 2010, ch. 18, and JR 16 of P.L. 2009)

TITLE 2A ADMINISTRATION OF CIVIL AND CRIMINAL JUSTICE

2A:44-143. Additional bond for payment of claims for labor, material, etc.; waiver, surety's obligation

2A:44-143. Additional bond for payment of claims for labor, material, etc.; waiver, surety's obligation

2A:44-143. a. (1) When public buildings or other public works or improvements are about to be constructed, erected, altered or repaired under contract, at the expense of the State or any contracting unit, as defined in section 2 of P.L.1971, c.198 (C.40A:11-2), or school district, the board, officer or agent contracting on behalf of the State, contracting unit or school district, shall require delivery of the payment and performance bond issued in accordance with N.J.S.2A:44-147 and otherwise, as provided for by law, with an obligation for the performance of the contract and for the payment by the contractor for all labor performed or materials, provisions, provender or other supplies, teams, fuels, oils, implements or machinery used or consumed in, upon, for or about the construction, erection, alteration or repair of such buildings, works or improvements provided by subcontractors or material suppliers in contract with the contractor, or subcontractors or material suppliers in contract with a subcontractor to the contractor, which class of persons shall be the beneficiaries of the payment and performance bond. The board, officer or agent shall also require that all payment and performance bonds be issued by a surety which meets the following standards:

(a) The surety shall have the minimum surplus and capital stock or net cash assets required by R.S.17:17-6 or R.S.17:17-7, whichever is appropriate, at the time the invitation to bid is issued; and

(b) With respect to all payment and performance bonds in the amount of \$850,000 or more, (i) if the amount of the bond is at least \$850,000 but not more than \$3.5 million, the surety shall hold a current certificate of authority, issued by the United States Secretary of the Treasury pursuant to 31 U.S.C. 9305, that is valid in the State of New Jersey as listed annually in the United States Treasury Circular 570, except that if the surety has been operational for a period in excess of five years, the surety shall be deemed to meet the requirements of this subsubparagraph if it is rated in one of the three highest categories by an independent, nationally recognized United States rating company that determines the financial stability of insurance companies, which rating company or companies shall be determined pursuant to standards promulgated by the Commissioner of Insurance by regulation adopted pursuant to the "Administrative Procedure Act," P.L.1968, c.410 (C.52:14B-1 et seq.), and (ii) if the amount of the bond is more than \$3.5 million, then the surety shall hold a current certificate of authority, issued by the United States Secretary of the Treasury pursuant to 31 U.S.C. 9305, that is valid in the State of New Jersey as listed annually in the United States Treasury Circular 570 and, if the surety has been operational for a period in excess of five years, shall be rated in one of the three highest categories by an independent, nationally recognized United States rating company that determines the financial stability of insurance companies, which rating company or companies shall be determined pursuant to standards promulgated by the Commissioner of Insurance by regulation adopted pursuant to the "Administrative Procedure Act," P.L.1968, c.410 (C.52:14B-1 et seq.). A surety subject to the provisions of subsubparagraph (ii) of this subparagraph which does not hold a certificate of authority issued by the United States Secretary of the Treasury shall be exempt from the requirement to hold such a certificate if the surety meets an equivalent set of standards developed by the Commissioner of Insurance through regulation which at least equal, and may exceed, the general criteria required for issuance of a certificate of authority by the United States Secretary of the Treasury pursuant to 31 U.S.C. 9305. A surety company seeking such an exemption shall, not later than the 180th day following the effective date of P.L.1995, c.384, certify to the appropriate contracting unit that it meets that equivalent set of standards set forth by the commissioner as promulgated.

(2) When such contract is to be performed at the expense of the State and is entered into by the Director of the Division of Building and Construction or State departments designated by the Director of the Division of Building and Construction, the director or the State departments may: (a) establish for that contract the amount of the bond at any percentage, not exceeding 100%, of the amount bid, based upon the director's or department's assessment of the risk presented to the State by the type of contract, and other relevant factors, and (b) waive the bond requirement of this section entirely if the contract is for a sum not exceeding \$200,000.

(3) When such a contract is to be performed at the expense of a contracting unit or school district, the board, officer or agent contracting on behalf of the contracting unit or school district may: (a) establish for that contract the amount of the bond at any percentage, not exceeding 100%, of the amount bid, based upon the board's, officer's or agent's assessment of the risk presented to the contracting unit or school district by the type of contract and other relevant factors, and (b) waive the bond requirement of this section entirely if the contract is for a sum not exceeding \$100,000.

b. A surety's obligation shall not extend to any claim for damages based upon alleged negligence that resulted in personal injury, wrongful death, or damage to real or personal property, and no bond shall in any way be construed as a liability insurance policy. Nothing herein shall relieve the surety's obligation to guarantee the contractor's performance of all conditions of the contract, including the maintenance of liability insurance if and as required by the contract. Only the obligee named on the bond, and any subcontractor performing labor or any subcontractor or materialman providing materials for the construction, erection, alteration or repair of the public building, work or improvement for which the bond is required pursuant to this section, shall have any claim against the surety under the bond.

c. A board, officer or agent contracting on behalf of the State, contracting unit or school district shall not accept more than one payment and performance bond to cover a single construction contract. The board, officer or agent may accept a single bond executed by more than one surety to cover a single construction contract only if the combined underwriting limitations of all the named sureties, as set forth in the most current annual revision of United States Treasury Circular 570, or as determined by the Commissioner of Insurance pursuant to R.S.17:18-9, meet or exceed the amount of the contract to be performed.

d. A board, officer or agent contracting on behalf of the State, contracting unit or school district shall not accept a payment or performance bond unless there is attached thereto a Surety Disclosure Statement and Certification to which each surety executing the bond shall have subscribed. This statement and certification shall be complete in all respects and duly acknowledged according to law, and shall have substantially the following form:

SURETY DISCLOSURE STATEMENT AND CERTIFICATION

....., surety(ies) on the attached bond, hereby certifies(y) the following:

(1) The surety meets the applicable capital and surplus requirements of R.S.17:17-6 or R.S.17:17-7 as of the surety's most current annual filing with the New Jersey Department of Insurance.

(2) The capital (where applicable) and surplus, as determined in accordance with the applicable laws of this State, of the surety(ies) participating in the issuance of the attached bond is (are) in the following amount(s) as of the calendar year ended December 31, (most recent calendar year for which capital and surplus amounts are available), which amounts have been certified as indicated by certified public accountants (indicating separately for each surety that surety's capital and surplus amounts, together with the name and address of the firm of certified public accounts that shall have certified those amounts):

.....
.....
.....

(3) (a) With respect to each surety participating in the issuance of the attached bond that has received from the United States Secretary of the Treasury a certificate of authority pursuant to 31 U.S.C. 9305, the underwriting limitation established therein and the date as of which that limitation was effective is as follows (indicating for each such surety that surety's underwriting limitation and the effective date thereof):

.....
.....
.....

(b) With respect to each surety participating in the issuance of the attached bond that has not received such a certificate of authority from the United States Secretary of the Treasury, the underwriting limitation of that surety as established pursuant to R.S.17:18-9 as of (date on which such limitation was so established) is as follows (indicating for each such surety that surety's underwriting limitation and the date on which that limitation was established):

.....
.....
.....

(4) The amount of the bond to which this statement and certification is attached is \$

(5) If, by virtue of one or more contracts of reinsurance, the amount of the bond indicated under item (4) above exceeds the total underwriting limitation of all sureties on the bond as set forth in items (3)(a) or (3)(b) above, or both, then for each such contract of reinsurance:

(a) The name and address of each such reinsurer under that contract and the amount of that reinsurer's participation in the contract is as follows:.....

.....
.....

.....; and

(b) Each surety that is party to any such contract of reinsurance certifies that each reinsurer listed under item (5)(a) satisfies the credit for reinsurance requirement established under P.L.1993, c.243 (C.17:51B-1 et seq.) and any applicable regulations in effect as of the date on which the bond to which this statement and certification is attached shall have been filed with the appropriate public agency.

CERTIFICATE

(to be completed by an authorized certifying agent

for each surety on the bond)

I (name of agent), as (title of agent) for
(name of surety), a corporation/mutual insurance company/other (indicating type of business
organization) (circle one) domiciled in (state of domicile), DO HEREBY CERTIFY that,
to the best of my knowledge, the foregoing statements made by me are true, and ACKNOWLEDGE that,
if any of those statements are false, this bond is VOIDABLE.

.....

(Signature of certifying agent)

.....

(Printed name of certifying agent)

.....

(Title of certifying agent)

L.1951 (1st SS), c.344; amended 1979, c.408; 1989, c.316; 1991, c.454; 1995, c.38, s.2; 1995, c.384,
s.1; 1996, c.81, s.2.

**2A:44-144. Sureties on and amount of bond; condition for payment of claims; bond deposited,
held for use of interested parties**

2A:44-144. The bond required by this article shall be executed by the contractor with such sureties
in accordance with N.J.S.2A:44-147 as shall be approved by the board, officer or agent acting on behalf
of the State, contracting unit or school district, in an amount equal to 100 per cent of the contract price.
The payment bond shall be conditioned for the payment by the contractor of all indebtedness which may
accrue to any person, firm or corporation designated as a "beneficiary" pursuant to N.J.S.2A:44-143, in an
amount not exceeding the sum specified in the bond, on account of any labor performed or materials,
provisions, provender or other supplies, or teams, fuels, oils, implements or machinery used or consumed
in, upon, for or about the construction, erection, alteration or repair of the public building or public work
or improvement.

The payment bond shall be deposited with and be held by the board, officer or agent acting on behalf
of the State, contracting unit or school district, for the use of any beneficiary thereof.

L.1951 (1st SS), c.344; amended 1995, c.384, s.2; 1996, c.81, s.3.

EXHIBIT NO. 11

LIST OF DRAWINGS

PASSAIC VALLEY SEWERAGE COMMISSION
600 WILSON AVENUE
NEWARK, NEW JERSEY 07105

WASTE ACTIVATED SLUDGE PUMPING STATION REPLACEMENT PROJECT

CONTRACT NO. A992

Index of Drawings

<u>Sheet No.</u>	<u>No.</u>	<u>Total</u>	<u>Title</u>
	1	25	Cover Sheet
G-1	2	25	Symbols, Notes and Abbreviations
G-2	3	25	Process Flow Diagram I
G-3	4	25	Process Flow Diagram II
G-4	5	25	WSL Sample Process Flow Diagram
M-1	6	25	O&M Building Basement WSL Sample Plan
M-2	7	25	O&M Building Basement WSL Sample Sections
M-3	8	25	O&M Building Sample Room Plan and Sections
M-4	9	25	Waste Sludge Pump Room Demolition Plan and Sections
M-5	10	25	Waste Sludge Pump Room Temporary Bypass Piping
M-6	11	25	Waste Sludge Pump Room Modifications Plan – Plan View
M-7	12	25	Waste Sludge Pump Room Modifications Plan – Section Views
M-8	13	25	Tunnel Piping Plans and Sections
MD-1	14	25	Mechanical Details I
MD-2	15	25	Mechanical Details II
I-1	16	25	Process & Instrumentation Legend & Symbols
I-2	17	25	SCADA System Architecture Diagram
I-3	18	25	Process & Instrumentation Diagram – I Waste Activated Sludge Pump Station
I-4	19	25	Process & Instrumentation Diagram – II WSL & HTPSR Piping
I-5	20	25	Instrumentation Details
E-1	21	25	Electrical Legend I
E-2	22	25	Electrical Legend II
E-3	23	25	WAS Pump Station Electrical One Line Diagram

Index of Drawings
(Continued)

E-4	24	25	WAS Pump Station Power Plan
E-5	25	25	WAS Pump Station Control Wiring and Electrical Details

SECTION 01010

SUMMARY OF WORK

PART 1: GENERAL

1.01 LOCATION OF WORK

- A. The Passaic Valley Sewerage Commission (PVSC) intends on having improvements made to the existing Waste Activated Sludge Pumping Station under Contract A992.
- B. The work of this Contract is located at Passaic Valley Sewerage Commission, in the City of Newark, Essex County, New Jersey.

1.02 SCOPE OF WORK

- A. Contractor shall furnish all labor, materials, equipment and incidentals required by the Contract Documents for the replacement of Waste Activated Sludge (WAS) Pumps; and perform all other appurtenances and related work required to complete the Project. All work and systems shall be as shown on the Drawings and as specified herein.
- B. Furnish all labor, materials, equipment and incidentals required to complete the Waste Activated Sludge (WAS) Pumping Station Expansion project in its entirety as shown on the Drawings and as specified herein.
- C. The Work includes, but is not necessarily limited to, the following work:
 - Item 1 Item 1 covers the General Conditions as set forth in the specifications Section 00700 of the Contract Documents.
 - Item 2 Purchase licenses for Project Management Software (PMWeb) as required in Section 01300. Train staff on software and use for project correspondence throughout the duration of the project.
 - Item 3 Furnish, install and remove temporary piping and valves necessary for the replacement of the pump discharge header and flow meter.
 - Item 4 Improvements to the intakes in the Wet Well of the Pumping Station
 - Item 5 Demolition of specific piping and valves and four existing WAS pumps and the Installation of the four Owner furnished WAS pumps and associated piping and valves.
 - Item 6 Installation of force main piping and valves and air release valves, salvage and installation of the existing pump discharge check valve electric actuators on new pump discharge check valves.
 - Item 7 Miscellaneous instrumentation improvements including, but not limited to installing seal water solenoids and flow elements, installation of a new force main flow meter,

furnishing and programming a new PLC and incorporating into the existing control system.

Item 8 Electrical work including powering the new pumps and miscellaneous field wiring.

Item 9 Furnishing and installing sample piping to the O and M building Sample Room and a new WAS Sample System.

1.03 WORK SEQUENCE

- A. Contractor shall accommodate Owner's occupancy during the construction period and ensure completion of the Work in the Contract Time. Completion dates of the various stages shall be in accordance with the approved construction schedule submitted by the Contractor.

1.04 CONTRACTOR'S USE OF PREMISES

- A. Contractor shall limit the use of the premises for his/her Work and for storage to allow for Owner occupancy and use.
- B. Coordinate use of premises with Owner or Engineer.
- C. Contractor shall assume full responsibility for security of all his/her and his/her subcontractors' materials and equipment stored on the site. Equipment storage areas and staging area are shown on the Drawings.
- D. If directed by the Owner or Engineer, move any stored items, which interfere with operations of Owner or other contractors.
- E. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.05 OWNER OCCUPANCY

- A. Owner will occupy premises during performance of the work to conduct his/her normal operations. Coordinate all construction operations with Owner or Engineer to minimize conflict and to facilitate Owner usage.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The Work shall include furnishing all labor, materials, equipment and incidentals required to complete the work specified herein and shown on the Contract Drawings and all addenda. The Bid Proposal for this Contract is a combination of lump sum costs, unit prices and allowance items.

1.02 MOBILIZATION (Bid Item No. 1)

A. Measurement and Payment

- 1. Mobilization shall consist of the cost of initiating the contract. Payment for mobilization will be made at the lump sum price bid for this item in the bid form which price shall include the cost of the initiating the contract. The provision for payment for mobilization shall supersede any provisions elsewhere in the specifications for including the costs of these initial services and facilities in the prices bid for the various items scheduled in the proposal. The lump sum price bid for mobilization shall be payable to the CONTRACTOR whenever he shall have completed ten (10) percent of the work of the contract.
- 2. For the purposes of this item, ten (10) percent of the work shall be considered completed when the total of payments earned, exclusive of the amount bid for this item, shown on the monthly certificates of the approximate quantities of work done, shall exceed ten (10) percent of the total price bid for the contract. The lump sum price bid for mobilization is limited to the following maximum amounts:

Total Original Contract Amount
(including mobilization)

<u>From More Than</u>	<u>To and Including</u>	<u>Maximum Amount for Item Mobilization</u>
\$ 0	\$ 100,000	\$ 3,000
100,000	500,000	15,000
500,000	1,000,000	30,000
1,000,000	2,000,000	60,000
2,000,000	3,000,000	90,000
3,000,000	4,000,000	120,000
4,000,000	5,000,000	125,000
5,000,000	6,000,000	150,000
6,000,000	7,000,000	175,000
7,000,000	10,000,000	200,000
10,000,000	---	2.5% of amount bid

3. Payment under this Item shall be made at the lump sum price bid in accordance with the provisions described herein. No additional payment shall be made for obtaining storage area, access or demobilization.
4. The lump sum price bid for mobilization is limited to percentage allowed by N.J.A.C 7:14-2.9.

1.03 HEAT TREATMENT PLANT SUPERNATANT RETURN (HTPSR) PIPELINE IMPROVEMENTS (Bid Item No. 2)

A. Measurement and Payment

1. Measurement for the HTPSR Pipeline will be on a lump sum basis.

Payment for the work shall be made at the lump sum price bid on the Bid Form and shall provide full compensation for furnishing all labor, materials, equipment, and incidentals required to complete the work as specified in Division 1 to 16 and as shown on the Drawings except for Item 1 above and Item 3 and 4 as outlined below. Payment shall also be full compensation for any other work which is not specified or shown but which is required to complete the work as shown on the Drawings and as specified herein.

1.04 LABOR, EQUIPMENT, AND MATERIALS PROVIDED BY A & W MAINTENANCE IN PROPOSAL NO. REV 1 15-1893, ATTACHED TO SECTION 09960 (Bid Item No. 3)

A. Measurement and Payment

1. Measurement for the Labor, Equipment, and Materials provided by A & W Maintenance shall be on a lump sum basis. Payment for the construction will be made at the lump sum price bid under Item No. 3 of the Bid Form and shall provide full compensation for furnishing all labor, materials, equipment, and incidentals required to complete the work as specified in Specification section, as shown the drawings and as outlined in Proposal No. REV 1 15-1893.

1.05 UNFORSEEN CONTINGENCIES (10% of Bid Item 1) (Bid Item No. 4)

A. Description

1. Under Contract Item 2, the Contractor shall perform work that may later be determined to be necessary for the completion of the project but is not covered in the bid documents.

B. Measurement and Payment

1. Measurement for Unforeseen Contingencies shall be on an as needed basis. Payment for the work shall be made at a price agreed upon by the Owner and shall provide full compensation for furnishing all labor, materials, equipment, and incidentals required to complete the work as necessary. The Unforeseen Contingency allowance is intended to provide for work that may later be determined to be necessary for the completion of the project but is not covered in the bid documents. Written authorization by the OWNER for utilization of any part of the contingency allowances for any such work shall be required.

1.06 EXTRA WORK

- A. Extra work, if any, will be performed in accordance with Articles 10, 11 and 12 of the General Conditions of the Contract and will be paid for in accordance with the provisions of those Articles and Article.

PART 2: PRODUCTS (NOT USED)

PART 3: EXECUTION (NOT USED)

END OF SECTION

SECTION 01045

CUTTING, CORING, AND PATCHING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This Section covers the cutting, coring, rough and finished patching of holes and openings. Holes and openings may be in existing construction, or in parts of new construction. Procedures for cutting and patching will be the same for either condition.
- B. Provide all cutting, fitting and patching, including attendant excavation and backfill, required to complete the work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the work to provide for installation of ill timed or improperly scheduled work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of Contract Documents.
 - 5. Remove samples of installed work as specified for testing.
 - 6. Provide penetrations of structural surfaces and materials for installation of piping, ductwork, equipment and electrical conduit.
 - 7. Provide penetrations of non-structural surfaces and materials for installation of piping, ductwork, equipment and electrical conduit. The determination of what is a nonstructural surface or material shall be made by the Engineer.
 - 8. Remove, install, or relocate materials or equipment.

1.02 RELATED WORK

- A. Site work is included in Division 2.
- B. Concrete is included in Division 3.
- C. Masonry is included in Division 4.
- D. Pipe penetrations and assemblies are included in Section 01180.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, a written request prior to executing any cutting or alteration which is not shown or detailed on the contract documents which affects or requires:
 - 1. Cutting structural members.

2. Holes drilled in beams or other structural members.
 3. Work of the Owner or any separate contractor.
 4. Structural value or integrity of any element of the project.
 5. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 6. Efficiency, operational life, maintenance or safety of operational elements.
 7. Visual qualities of sight-exposed elements.
- B. Request shall include:
1. Identification of the project.
 2. Description of affected work.
 3. The reason for cutting, alteration or excavation.
 4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of project.
 5. Description of proposed work:
 - a. Method and extent of cutting, patching, alteration, or excavation.
 - b. Trades who will execute the work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 6. Alternatives to cutting and patching.
 7. If the work is considered out of scope, provide a cost proposal.
 8. Confirmation of coordination with any separate contractor whose work will be affected.
 9. Related shutdown requests if required to do the work.
 10. Request for hot work permit if required to do the work.
- C. Submit written notice to the Construction Manager designating the date and the time the work will be uncovered.
- D. When a written request is required, do not proceed with the work until a written notice to proceed is received from the Construction Manager.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Comply with specifications and standards for each specific product involved. Where there is no equivalent specification, the Contractor shall notify the Engineer who will provide a specification for the materials to be used.
- B. Concrete and grout for rough patching shall be as specified in Division 3.
- C. Materials for finish patching shall be equal to those of adjacent construction. Where existing materials are no longer available, use materials with equivalent properties and that will provide the same appearance. The materials are to be approved by the Engineer prior to their use.

PART 3: EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- C. Report unsatisfactory or questionable conditions to the Construction Manager in writing; do not proceed with work until the Construction Manager has provided further instructions.

3.02 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- B. Protect surrounding materials and equipment prior to starting work.
- C. Contain and control cooling liquids and slurry produced by the cutting and coring operations.
- D. When the cutting or coring will result in the structure or equipment being exposed to provide adequate weather protection.

3.03 PERFORMANCE

- A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work. When excavating in close proximity to piping, duct banks or other items subject to damage, use hand excavation.
- C. Where possible, employ original installer or fabricator to perform cutting and patching for:
 - 1. Weather-exposed or moisture-resistant elements.

2. Sight-exposed finished surfaces.
- D. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
 - E. Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.
 - F. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 1. For continuous surfaces, refinish to nearest intersection.
 2. For an assembly, refinish entire unit.
 - G. Remove rubble and excess patching materials from the premises.

3.04 CORING

- A. All coring shall be performed in such a manner as to limit the extent of patching. Locate the rebar before coring to minimize cut throughs.
- B. Coring shall be performed with an approved non-impact rotary tool with diamond core drills.
- C. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.
- D. Fit work to minimize space to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- E. Fit to pipes and other penetrations in tanks to be water tight using seals or other methods defined in the specifications.
- F. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled unless otherwise approved. All work shall be performed by mechanics skilled in this type of work.
- G. If holes are cored through floor slabs they shall be drilled from below where possible. If holes are drilled from above, provide protection and containment below the area being drilled to catch the plug and contain liquid and slurry.

3.05 CUTTING

- A. All cutting shall be performed in such a manner as to limit the extent of patching.
- B. Fit work to minimize space to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- C. Cutting shall be performed with a concrete saw and diamond saw blades of proper size.
- D. Provide for control of slurry generated by sawing operation on both sides of wall and from below if cutting a floor.

- E. When cutting a reinforced concrete wall or floor, the cutting shall be done so as not to damage the bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from face of the cut.
- F. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.
- G. Provide equipment of adequate size to remove cut panel.
- H. Saw cut concrete and masonry prior to breaking out sections.
- I. Install work at such time as to require the minimum amount of cutting and patching.
- J. All cutting of structural members shall be done in a manner directed by the Engineer.
- K. Cut opening only large enough to allow easy installation of the equipment, ducting, piping or conduit.
- L. When existing conduits or pipe sleeves are cut off at the floor line or wall line, they shall be filled with grout or suitable patching material.

3.06 PROTECTION

- A. Provide devices and methods to protect other portions of project from damage.
- B. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work.
- C. Maintain excavations free from water.

3.07 PATCHING

- A. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown.
- B. Finish patching shall match existing surfaces as approved.
- C. Patching shall be of the same kind and quality of material as was removed.
- D. The completed patching work shall restore the surface to its original appearance or better.
- E. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed to include the joint between the existing material and the patch.
- F. Equipment damaged during cutting and patching shall be replaced or repaired by the equipment manufacturer, at the Construction Manager's sole discretion and at the expense of the Contractor doing the work.
- G. Repaint any damage to factory applied paint finishes using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted in accordance

with the field painting requirements specified in Section 09902 at the expense of the Contractor doing the work.

- H. Slurry or tailings resulting from coring or cutting operations shall be contained and vacuumed or otherwise removed from the area following drilling or cut.
- I. Equipment shall be protected against mechanical and water damage during cutting and patching. Provide protective covers or use other means such as temporary relocation to protect equipment that is at risk of damage from the cutting and patching
- J. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.

END OF SECTION

SECTION 01046

CONTROL OF WORK

PART 1: GENERAL

1.01 CONSTRUCTION EQUIPMENT

- A. Furnish equipment that will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress that will insure the completion of the work within the Contract Time. If at any time it appears to the Engineer to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, he/she may order the Contractor to increase the efficiency, change the character or increase the plant equipment and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his/her obligations to secure the quality of the work and rate of progress required.

1.02 PIPE LOCATIONS

- A. Pipe locations shall be located substantially as indicated on the Drawings, but the Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him/her from laying and jointing different or additional items where required.

1.03 CARE AND PROTECTION OF PROPERTY

- A. The Contractor shall be responsible for the preservation of all public and private property and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his/her expense, to a condition similar or equal to that existing before the damage was done, or he/she shall make good the damage in other manner acceptable to the Engineer.

1.04 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

- A. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including signs, services to buildings, utilities, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operations shall be repaired by him/her at his/her expense.
- B. Protection and temporary removal and replacement of existing utilities and structures as described in this Section shall be a part of the work under the Contract and all costs in connection therewith shall be included in the Price Bid in the Bid Form.
- C. If, in the opinion of the Engineer, permanent relocation of a utility, other than those indicated on the Drawings, is required, he/she may direct the Contractor, in writing, to perform the work. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work under Article 6 of the General Conditions. If relocation of a privately owned utility is required, the Owner will

notify the Utility to perform the work as expeditiously as possible. The Contractor shall fully cooperate with the Owner and Utility and shall have no claim for delay due to such relocation.

1.05 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

- A. During the course of the work, the Contractor shall keep the site of his/her operations in as clean and neat a condition as is possible. He/she shall dispose of all residues resulting from the construction work and, at the conclusion of the work, he/she shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and shall leave the entire site of the work in a neat and orderly condition.
- B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor and his/her subcontractors shall comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and elsewhere in the Specifications.

END OF SECTION

SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes; or violate any applicable environmental regulation.
- B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.
- C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area.
- D. This Specification is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.
- E. All phases of sedimentation and erosion control shall conform to the requirements outlined in the Standards for Soil Erosion and Sediment Control in New Jersey, latest edition including Addenda.

1.02 APPLICABLE REGULATIONS

- A. Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

1.03 NOTIFICATIONS

- A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. The Contractor shall, after receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the

Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.04 IMPLEMENTATION

- A. Prior to commencement of the work, meet with the Engineer to develop mutual understandings relative to compliance with this provision and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when approved by the Engineer, and incorporate permanent control features into the project at the earliest practicable time.

PART 2: PRODUCTS - (NONE THIS SECTION)

PART 3: EXECUTION

3.01 ENVIRONMENTAL AND CULTURAL RESOURCE PROTECTION/RESTORATION

- A. These specifications which spell out the environmental and cultural resource protection/restoration shall have precedence over other potentially contradictory language contained elsewhere in the design Contract Documents. [In instances where the provisions of a New Jersey Department of Environmental Protection-issued permit contradict a provision of the specifications (including those identified in Environmental Assessment Requirements for State Assisted Environmental Infrastructure Facilities, N.J.A.C. 7:22-10), the environmental resources protection and/or restoration and cultural resource mitigation measures identified in the Department-issued permit shall govern.]
- B. All activities which are part of the comprehensive environmental infrastructure project(s) for the planning area must conform to the requirements of this section regardless of the eligibility of individual components of the project.

3.02 EROSION AND SEDIMENT CONTROL

- A. Every effort shall be made to prevent and correct problems associated with erosion and sedimentation which could occur during and after project construction. At a minimum, erosion and sediment control measures shall conform to the following:
 - 1. All erosion and sedimentation control measures shall be in place prior to any grading operations or construction of proposed facilities and shall be maintained until construction is complete and the construction area is stabilized. After restoration is complete, temporary control measures shall be removed and disposed of properly.
 - 2. All erosion and sedimentation control measures shall be constructed and maintained in accordance with the current "Standards for Soil Erosion and Sediment Control in New Jersey." prepared by the New Jersey State Soil Conservation Committee.

3. Disturbed areas that will be exposed in excess of 14 days shall be temporarily seeded and/or mulched until proper weather conditions exist for establishment of a permanent vegetative cover.

3.03 SITE AND ACCESS CLEARING

- A. Site and access clearing must be confined to approved construction areas. Protection of existing vegetation must be practiced wherever possible. At a minimum, site access and clearing measures shall conform to the following:
 1. Temporary and permanent easement widths must be reduced to the minimum feasible for the proposed construction. Unless specifically approved by the Owner and the New Jersey Department of Environmental Protection, permanent access roads must not be more than eight feet wide, and there shall be no permanent access roads in environmentally critical areas. Access roads may be paved only where absolutely necessary, as determined by the Owner and the New Jersey Department of Environmental Protection.
 2. Only those portions of the site which are absolutely necessary and essential for construction shall be cleared. Whenever possible, excavation shall include the removal and storage of topsoil from the site for future use. The length of time of ground disturbance shall be reduced to the minimum practicable, especially in environmentally critical areas. Ground disturbance shall be avoided until immediately preceding construction to minimize exposure of soils.
 3. Trees and shrubs within construction easements, which are not required to be removed to permit construction, shall be protected to the drip line with appropriate protection measures such as snow fencing or batter boards. Trees and shrubs whose removal is necessary to facilitate construction shall either be replanted at the same location or replaced with nursery stock of the same kind. Trees of greater than 12 inches in diameter should be preserved whenever possible by implementing slight shifts in alignment or tunneling under tree roots. Specimen trees, as identified in "New Jersey's Big Trees" (1998) published by the Department's Division of Parks and Forestry listing specimen trees in the State, shall be preserved.
 4. In heavily wooded areas, every effort shall be made to avoid the destruction of common native trees and shrubs so as not to unduly disturb the ecological balance or environmental quality of the area. Trees of 12 inch diameter or greater should be preserved whenever possible and protected to the drip line. Where practical, common native trees and shrubs, of one through three-inch caliper, which must be cleared from the construction area, shall be stockpiled for use in restoration. Straggling roots shall be pruned. Trees which must be pruned to facilitate construction shall be cut cleanly and painted with tree paint. If a tree not intended to be removed is damaged, the wood shall be repaired according to common nursery practice and painted with tree paint.
- B. Only those portions of the site which are absolutely necessary and essential for construction shall be cleared. Whenever possible, excavation shall include the removal and storage of topsoil from the site for future use. The length of time of ground disturbance shall be reduced to the minimum practicable, especially in environmentally critical areas. Ground disturbance shall be avoided until immediately preceding construction to minimize exposure of soils.

3.04 RESTORATION MEASURES

- A. The aim of restoration is to restore the disturbed area to a condition as nearly equal to pre-disturbance condition as possible. At a minimum, restoration measures shall conform to the following:
1. Final restoration shall be undertaken as soon as an area is no longer needed for construction, stockpiling or access. Excavated material unsuitable for backfill as set forth at N.J.A.C. 7:14-2.13 and considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be removed from the construction site and disposed of at a sanitary landfill approved and licensed by the New Jersey Department of Environmental Protection.
 2. Excess excavated material which is not considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be graded or removed in accordance with N.J.A.C. 7:22-10.11(l)3. When access roads are no longer needed, road fill shall be removed and the access area shall be restored to pre-disturbance conditions.
 3. Care should be taken to avoid damage to adjacent vegetation and to prevent the formation of depressions that would serve as mosquito pools.
 4. Topsoil shall be replaced with adequate amounts of topsoil material to restore the disturbed area to its original, pre-disturbance grade and depth of topsoil.
 5. Rates and types of fertilization, liming, and seeding shall be as recommended by the local Soil Conservation District based on soil tests and local conditions. Seed mixtures shall be selected that are best suited for the particular site conditions. Seed selection shall provide for a quickly germinating initial growth, to prevent erosion, and for a secondary growth that will survive without continuing maintenance. Mulching shall occur immediately after seeding and in no case shall more than five days elapse between seeding and mulching.
 6. In wooded areas, for a 50-foot wide construction easement, generally 10 trees should be planted for every 100 feet of length of the easement. More trees would be required in wider easements or densely wooded areas. Plans shall include a restoration schedule specifying the quantity, common and botanic names, sizes, and spacing of trees to be planted and the type of seed mixtures to be used from station to station. Trees to be replaced should be trees native to New Jersey suitable for the particular site and generally should conform to the list of trees found in the current "Standards for Soil Erosion and Sediment Control in New Jersey," prepared by the New Jersey State Soil Conservation Committee, incorporated herein by reference, as amended and supplemented.
 7. In landscaped areas, environmental features shall be replaced or restored to pre-disturbance condition or better. This includes sodding, replacement of trees and shrubs, fences, drives, and other landscape features in kind.

3.05 PROHIBITED CONSTRUCTION PROCEDURES

- A. Prohibited construction procedures include, but are not limited to, the following:
1. Dumping of spoil material into any stream corridor, any wetlands, any vernal habitats, any surface waters, any sites listed or eligible for listing on the New Jersey or National Registers of Historic Places, or at unspecified locations;

SECTION 01010

SUMMARY OF WORK

PART 1: GENERAL

1.01 LOCATION OF WORK

- A. The Passaic Valley Sewerage Commission (PVSC) intends on having improvements made to the existing Waste Activated Sludge Pumping Station under Contract A992.
- B. The work of this Contract is located at Passaic Valley Sewerage Commission, in the City of Newark, Essex County, New Jersey.

1.02 SCOPE OF WORK

- A. Contractor shall furnish all labor, materials, equipment and incidentals required by the Contract Documents for the replacement of Waste Activated Sludge (WAS) Pumps; and perform all other appurtenances and related work required to complete the Project. All work and systems shall be as shown on the Drawings and as specified herein.
- B. Furnish all labor, materials, equipment and incidentals required to complete the Waste Activated Sludge (WAS) Pumping Station Expansion project in its entirety as shown on the Drawings and as specified herein.
- C. The Work includes, but is not necessarily limited to, the following work:
 - Item 1 Item 1 covers the General Conditions as set forth in the specifications Section 00700 of the Contract Documents.
 - Item 2 Purchase licenses for Project Management Software (PMWeb) as required in Section 01300. Train staff on software and use for project correspondence throughout the duration of the project.
 - Item 3 Furnish, install and remove temporary piping and valves necessary for the replacement of the pump discharge header and flow meter.
 - Item 4 Improvements to the intakes in the Wet Well of the Pumping Station
 - Item 5 Demolition of specific piping and valves and four existing WAS pumps and the Installation of the four Owner furnished WAS pumps and associated piping and valves.
 - Item 6 Installation of force main piping and valves and air release valves, salvage and installation of the existing pump discharge check valve electric actuators on new pump discharge check valves.
 - Item 7 Miscellaneous instrumentation improvements including, but not limited to installing seal water solenoids and flow elements, installation of a new force main flow meter,

furnishing and programming a new PLC and incorporating into the existing control system.

Item 8 Electrical work including powering the new pumps and miscellaneous field wiring.

Item 9 Furnishing and installing sample piping to the O and M building Sample Room and a new WAS Sample System.

1.03 WORK SEQUENCE

- A. Contractor shall accommodate Owner's occupancy during the construction period and ensure completion of the Work in the Contract Time. Completion dates of the various stages shall be in accordance with the approved construction schedule submitted by the Contractor.

1.04 CONTRACTOR'S USE OF PREMISES

- A. Contractor shall limit the use of the premises for his/her Work and for storage to allow for Owner occupancy and use.
- B. Coordinate use of premises with Owner or Engineer.
- C. Contractor shall assume full responsibility for security of all his/her and his/her subcontractors' materials and equipment stored on the site. Equipment storage areas and staging area are shown on the Drawings.
- D. If directed by the Owner or Engineer, move any stored items, which interfere with operations of Owner or other contractors.
- E. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.05 OWNER OCCUPANCY

- A. Owner will occupy premises during performance of the work to conduct his/her normal operations. Coordinate all construction operations with Owner or Engineer to minimize conflict and to facilitate Owner usage.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. The Work shall include furnishing all labor, materials, equipment and incidentals required to complete the work specified herein and shown on the Contract Drawings and all addenda. The Bid Proposal for this Contract is a combination of lump sum costs, unit prices and allowance items.

1.02 MOBILIZATION (Bid Item No. 1)

A. Measurement and Payment

1. Mobilization shall consist of the cost of initiating the contract. Payment for mobilization will be made at the lump sum price bid for this item in the bid form which price shall include the cost of the initiating the contract. The provision for payment for mobilization shall supersede any provisions elsewhere in the specifications for including the costs of these initial services and facilities in the prices bid for the various items scheduled in the proposal. The lump sum price bid for mobilization shall be payable to the CONTRACTOR whenever he shall have completed ten (10) percent of the work of the contract.
2. For the purposes of this item, ten (10) percent of the work shall be considered completed when the total of payments earned, exclusive of the amount bid for this item, shown on the monthly certificates of the approximate quantities of work done, shall exceed ten (10) percent of the total price bid for the contract. The lump sum price bid for mobilization is limited to the following maximum amounts:

Total Original Contract Amount
(including mobilization)

<u>From More Than</u>	<u>To and Including</u>	<u>Maximum Amount for Item Mobilization</u>
\$ 0	\$ 100,000	\$ 3,000
100,000	500,000	15,000
500,000	1,000,000	30,000
1,000,000	2,000,000	60,000
2,000,000	3,000,000	90,000
3,000,000	4,000,000	120,000
4,000,000	5,000,000	125,000
5,000,000	6,000,000	150,000
6,000,000	7,000,000	175,000
7,000,000	10,000,000	200,000
10,000,000	---	2.5% of amount bid

3. Payment under this Item shall be made at the lump sum price bid in accordance with the provisions described herein. No additional payment shall be made for obtaining storage area, access or demobilization.
4. The lump sum price bid for mobilization is limited to percentage allowed by N.J.A.C 7:14-2.9.

1.03 HEAT TREATMENT PLANT SUPERNATANT RETURN (HTPSR) PIPELINE IMPROVEMENTS (Bid Item No. 2)

A. Measurement and Payment

1. Measurement for the HTPSR Pipeline will be on a lump sum basis.

Payment for the work shall be made at the lump sum price bid on the Bid Form and shall provide full compensation for furnishing all labor, materials, equipment, and incidentals required to complete the work as specified in Division 1 to 16 and as shown on the Drawings except for Item 1 above and Item 3 and 4 as outlined below. Payment shall also be full compensation for any other work which is not specified or shown but which is required to complete the work as shown on the Drawings and as specified herein.

1.04 LABOR, EQUIPMENT, AND MATERIALS PROVIDED BY A & W MAINTENANCE IN PROPOSAL NO. REV 1 15-1893, ATTACHED TO SECTION 09960 (Bid Item No. 3)

A. Measurement and Payment

1. Measurement for the Labor, Equipment, and Materials provided by A & W Maintenance shall be on a lump sum basis. Payment for the construction will be made at the lump sum price bid under Item No. 3 of the Bid Form and shall provide full compensation for furnishing all labor, materials, equipment, and incidentals required to complete the work as specified in Specification section, as shown the drawings and as outlined in Proposal No. REV 1 15-1893.

1.05 UNFORSEEN CONTINGENCIES (10% of Bid Item 1) (Bid Item No. 4)

A. Description

1. Under Contract Item 2, the Contractor shall perform work that may later be determined to be necessary for the completion of the project but is not covered in the bid documents.

B. Measurement and Payment

1. Measurement for Unforeseen Contingencies shall be on an as needed basis. Payment for the work shall be made at a price agreed upon by the Owner and shall provide full compensation for furnishing all labor, materials, equipment, and incidentals required to complete the work as necessary. The Unforeseen Contingency allowance is intended to provide for work that may later be determined to be necessary for the completion of the project but is not covered in the bid documents. Written authorization by the OWNER for utilization of any part of the contingency allowances for any such work shall be required.

1.06 EXTRA WORK

- A. Extra work, if any, will be performed in accordance with Articles 10, 11 and 12 of the General Conditions of the Contract and will be paid for in accordance with the provisions of those Articles and Article.

PART 2: PRODUCTS (NOT USED)

PART 3: EXECUTION (NOT USED)

END OF SECTION

SECTION 01045

CUTTING, CORING, AND PATCHING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This Section covers the cutting, coring, rough and finished patching of holes and openings. Holes and openings may be in existing construction, or in parts of new construction. Procedures for cutting and patching will be the same for either condition.
- B. Provide all cutting, fitting and patching, including attendant excavation and backfill, required to complete the work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the work to provide for installation of ill timed or improperly scheduled work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of Contract Documents.
 - 5. Remove samples of installed work as specified for testing.
 - 6. Provide penetrations of structural surfaces and materials for installation of piping, ductwork, equipment and electrical conduit.
 - 7. Provide penetrations of non-structural surfaces and materials for installation of piping, ductwork, equipment and electrical conduit. The determination of what is a nonstructural surface or material shall be made by the Engineer.
 - 8. Remove, install, or relocate materials or equipment.

1.02 RELATED WORK

- A. Site work is included in Division 2.
- B. Concrete is included in Division 3.
- C. Masonry is included in Division 4.
- D. Pipe penetrations and assemblies are included in Section 01180.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, a written request prior to executing any cutting or alteration which is not shown or detailed on the contract documents which affects or requires:
 - 1. Cutting structural members.

2. Holes drilled in beams or other structural members.
 3. Work of the Owner or any separate contractor.
 4. Structural value or integrity of any element of the project.
 5. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 6. Efficiency, operational life, maintenance or safety of operational elements.
 7. Visual qualities of sight-exposed elements.
- B. Request shall include:
1. Identification of the project.
 2. Description of affected work.
 3. The reason for cutting, alteration or excavation.
 4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of project.
 5. Description of proposed work:
 - a. Method and extent of cutting, patching, alteration, or excavation.
 - b. Trades who will execute the work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 6. Alternatives to cutting and patching.
 7. If the work is considered out of scope, provide a cost proposal.
 8. Confirmation of coordination with any separate contractor whose work will be affected.
 9. Related shutdown requests if required to do the work.
 10. Request for hot work permit if required to do the work.
- C. Submit written notice to the Construction Manager designating the date and the time the work will be uncovered.
- D. When a written request is required, do not proceed with the work until a written notice to proceed is received from the Construction Manager.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Comply with specifications and standards for each specific product involved. Where there is no equivalent specification, the Contractor shall notify the Engineer who will provide a specification for the materials to be used.
- B. Concrete and grout for rough patching shall be as specified in Division 3.
- C. Materials for finish patching shall be equal to those of adjacent construction. Where existing materials are no longer available, use materials with equivalent properties and that will provide the same appearance. The materials are to be approved by the Engineer prior to their use.

PART 3: EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- C. Report unsatisfactory or questionable conditions to the Construction Manager in writing; do not proceed with work until the Construction Manager has provided further instructions.

3.02 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- B. Protect surrounding materials and equipment prior to starting work.
- C. Contain and control cooling liquids and slurry produced by the cutting and coring operations.
- D. When the cutting or coring will result in the structure or equipment being exposed to provide adequate weather protection.

3.03 PERFORMANCE

- A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work. When excavating in close proximity to piping, duct banks or other items subject to damage, use hand excavation.
- C. Where possible, employ original installer or fabricator to perform cutting and patching for:
 - 1. Weather-exposed or moisture-resistant elements.

2. Sight-exposed finished surfaces.
- D. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
 - E. Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.
 - F. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 1. For continuous surfaces, refinish to nearest intersection.
 2. For an assembly, refinish entire unit.
 - G. Remove rubble and excess patching materials from the premises.

3.04 CORING

- A. All coring shall be performed in such a manner as to limit the extent of patching. Locate the rebar before coring to minimize cut throughs.
- B. Coring shall be performed with an approved non-impact rotary tool with diamond core drills.
- C. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.
- D. Fit work to minimize space to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- E. Fit to pipes and other penetrations in tanks to be water tight using seals or other methods defined in the specifications.
- F. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled unless otherwise approved. All work shall be performed by mechanics skilled in this type of work.
- G. If holes are cored through floor slabs they shall be drilled from below where possible. If holes are drilled from above, provide protection and containment below the area being drilled to catch the plug and contain liquid and slurry.

3.05 CUTTING

- A. All cutting shall be performed in such a manner as to limit the extent of patching.
- B. Fit work to minimize space to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- C. Cutting shall be performed with a concrete saw and diamond saw blades of proper size.
- D. Provide for control of slurry generated by sawing operation on both sides of wall and from below if cutting a floor.

- E. When cutting a reinforced concrete wall or floor, the cutting shall be done so as not to damage the bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from face of the cut.
- F. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.
- G. Provide equipment of adequate size to remove cut panel.
- H. Saw cut concrete and masonry prior to breaking out sections.
- I. Install work at such time as to require the minimum amount of cutting and patching.
- J. All cutting of structural members shall be done in a manner directed by the Engineer.
- K. Cut opening only large enough to allow easy installation of the equipment, ducting, piping or conduit.
- L. When existing conduits or pipe sleeves are cut off at the floor line or wall line, they shall be filled with grout or suitable patching material.

3.06 PROTECTION

- A. Provide devices and methods to protect other portions of project from damage.
- B. Provide protection from elements for that portion of the project which may be exposed by cutting and patching work.
- C. Maintain excavations free from water.

3.07 PATCHING

- A. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown.
- B. Finish patching shall match existing surfaces as approved.
- C. Patching shall be of the same kind and quality of material as was removed.
- D. The completed patching work shall restore the surface to its original appearance or better.
- E. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed to include the joint between the existing material and the patch.
- F. Equipment damaged during cutting and patching shall be replaced or repaired by the equipment manufacturer, at the Construction Manager's sole discretion and at the expense of the Contractor doing the work.
- G. Repaint any damage to factory applied paint finishes using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted in accordance

with the field painting requirements specified in Section 09902 at the expense of the Contractor doing the work.

- H. Slurry or tailings resulting from coring or cutting operations shall be contained and vacuumed or otherwise removed from the area following drilling or cut.
- I. Equipment shall be protected against mechanical and water damage during cutting and patching. Provide protective covers or use other means such as temporary relocation to protect equipment that is at risk of damage from the cutting and patching
- J. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.

END OF SECTION

SECTION 01046

CONTROL OF WORK

PART 1: GENERAL

1.01 CONSTRUCTION EQUIPMENT

- A. Furnish equipment that will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress that will insure the completion of the work within the Contract Time. If at any time it appears to the Engineer to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, he/she may order the Contractor to increase the efficiency, change the character or increase the plant equipment and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his/her obligations to secure the quality of the work and rate of progress required.

1.02 PIPE LOCATIONS

- A. Pipe locations shall be located substantially as indicated on the Drawings, but the Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him/her from laying and jointing different or additional items where required.

1.03 CARE AND PROTECTION OF PROPERTY

- A. The Contractor shall be responsible for the preservation of all public and private property and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his/her expense, to a condition similar or equal to that existing before the damage was done, or he/she shall make good the damage in other manner acceptable to the Engineer.

1.04 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

- A. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including signs, services to buildings, utilities, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operations shall be repaired by him/her at his/her expense.
- B. Protection and temporary removal and replacement of existing utilities and structures as described in this Section shall be a part of the work under the Contract and all costs in connection therewith shall be included in the Price Bid in the Bid Form.
- C. If, in the opinion of the Engineer, permanent relocation of a utility, other than those indicated on the Drawings, is required, he/she may direct the Contractor, in writing, to perform the work. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work under Article 6 of the General Conditions. If relocation of a privately owned utility is required, the Owner will

notify the Utility to perform the work as expeditiously as possible. The Contractor shall fully cooperate with the Owner and Utility and shall have no claim for delay due to such relocation.

1.05 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

- A. During the course of the work, the Contractor shall keep the site of his/her operations in as clean and neat a condition as is possible. He/she shall dispose of all residues resulting from the construction work and, at the conclusion of the work, he/she shall remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and shall leave the entire site of the work in a neat and orderly condition.
- B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor and his/her subcontractors shall comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and elsewhere in the Specifications.

END OF SECTION

SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes; or violate any applicable environmental regulation.
- B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.
- C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area.
- D. This Specification is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.
- E. All phases of sedimentation and erosion control shall conform to the requirements outlined in the Standards for Soil Erosion and Sediment Control in New Jersey, latest edition including Addenda.

1.02 APPLICABLE REGULATIONS

- A. Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

1.03 NOTIFICATIONS

- A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. The Contractor shall, after receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the

Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.04 IMPLEMENTATION

- A. Prior to commencement of the work, meet with the Engineer to develop mutual understandings relative to compliance with this provision and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when approved by the Engineer, and incorporate permanent control features into the project at the earliest practicable time.

PART 2: PRODUCTS - (NONE THIS SECTION)

PART 3: EXECUTION

3.01 ENVIRONMENTAL AND CULTURAL RESOURCE PROTECTION/RESTORATION

- A. These specifications which spell out the environmental and cultural resource protection/restoration shall have precedence over other potentially contradictory language contained elsewhere in the design Contract Documents. [In instances where the provisions of a New Jersey Department of Environmental Protection-issued permit contradict a provision of the specifications (including those identified in Environmental Assessment Requirements for State Assisted Environmental Infrastructure Facilities, N.J.A.C. 7:22-10), the environmental resources protection and/or restoration and cultural resource mitigation measures identified in the Department-issued permit shall govern.]
- B. All activities which are part of the comprehensive environmental infrastructure project(s) for the planning area must conform to the requirements of this section regardless of the eligibility of individual components of the project.

3.02 EROSION AND SEDIMENT CONTROL

- A. Every effort shall be made to prevent and correct problems associated with erosion and sedimentation which could occur during and after project construction. At a minimum, erosion and sediment control measures shall conform to the following:
 - 1. All erosion and sedimentation control measures shall be in place prior to any grading operations or construction of proposed facilities and shall be maintained until construction is complete and the construction area is stabilized. After restoration is complete, temporary control measures shall be removed and disposed of properly.
 - 2. All erosion and sedimentation control measures shall be constructed and maintained in accordance with the current "Standards for Soil Erosion and Sediment Control in New Jersey." prepared by the New Jersey State Soil Conservation Committee.

3. Disturbed areas that will be exposed in excess of 14 days shall be temporarily seeded and/or mulched until proper weather conditions exist for establishment of a permanent vegetative cover.

3.03 SITE AND ACCESS CLEARING

- A. Site and access clearing must be confined to approved construction areas. Protection of existing vegetation must be practiced wherever possible. At a minimum, site access and clearing measures shall conform to the following:
 1. Temporary and permanent easement widths must be reduced to the minimum feasible for the proposed construction. Unless specifically approved by the Owner and the New Jersey Department of Environmental Protection, permanent access roads must not be more than eight feet wide, and there shall be no permanent access roads in environmentally critical areas. Access roads may be paved only where absolutely necessary, as determined by the Owner and the New Jersey Department of Environmental Protection.
 2. Only those portions of the site which are absolutely necessary and essential for construction shall be cleared. Whenever possible, excavation shall include the removal and storage of topsoil from the site for future use. The length of time of ground disturbance shall be reduced to the minimum practicable, especially in environmentally critical areas. Ground disturbance shall be avoided until immediately preceding construction to minimize exposure of soils.
 3. Trees and shrubs within construction easements, which are not required to be removed to permit construction, shall be protected to the drip line with appropriate protection measures such as snow fencing or batter boards. Trees and shrubs whose removal is necessary to facilitate construction shall either be replanted at the same location or replaced with nursery stock of the same kind. Trees of greater than 12 inches in diameter should be preserved whenever possible by implementing slight shifts in alignment or tunneling under tree roots. Specimen trees, as identified in "New Jersey's Big Trees" (1998) published by the Department's Division of Parks and Forestry listing specimen trees in the State, shall be preserved.
 4. In heavily wooded areas, every effort shall be made to avoid the destruction of common native trees and shrubs so as not to unduly disturb the ecological balance or environmental quality of the area. Trees of 12 inch diameter or greater should be preserved whenever possible and protected to the drip line. Where practical, common native trees and shrubs, of one through three-inch caliper, which must be cleared from the construction area, shall be stockpiled for use in restoration. Straggling roots shall be pruned. Trees which must be pruned to facilitate construction shall be cut cleanly and painted with tree paint. If a tree not intended to be removed is damaged, the wood shall be repaired according to common nursery practice and painted with tree paint.
- B. Only those portions of the site which are absolutely necessary and essential for construction shall be cleared. Whenever possible, excavation shall include the removal and storage of topsoil from the site for future use. The length of time of ground disturbance shall be reduced to the minimum practicable, especially in environmentally critical areas. Ground disturbance shall be avoided until immediately preceding construction to minimize exposure of soils.

3.04 RESTORATION MEASURES

- A. The aim of restoration is to restore the disturbed area to a condition as nearly equal to pre-disturbance condition as possible. At a minimum, restoration measures shall conform to the following:
1. Final restoration shall be undertaken as soon as an area is no longer needed for construction, stockpiling or access. Excavated material unsuitable for backfill as set forth at N.J.A.C. 7:14-2.13 and considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be removed from the construction site and disposed of at a sanitary landfill approved and licensed by the New Jersey Department of Environmental Protection.
 2. Excess excavated material which is not considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be graded or removed in accordance with N.J.A.C. 7:22-10.11(l)3. When access roads are no longer needed, road fill shall be removed and the access area shall be restored to pre-disturbance conditions.
 3. Care should be taken to avoid damage to adjacent vegetation and to prevent the formation of depressions that would serve as mosquito pools.
 4. Topsoil shall be replaced with adequate amounts of topsoil material to restore the disturbed area to its original, pre-disturbance grade and depth of topsoil.
 5. Rates and types of fertilization, liming, and seeding shall be as recommended by the local Soil Conservation District based on soil tests and local conditions. Seed mixtures shall be selected that are best suited for the particular site conditions. Seed selection shall provide for a quickly germinating initial growth, to prevent erosion, and for a secondary growth that will survive without continuing maintenance. Mulching shall occur immediately after seeding and in no case shall more than five days elapse between seeding and mulching.
 6. In wooded areas, for a 50-foot wide construction easement, generally 10 trees should be planted for every 100 feet of length of the easement. More trees would be required in wider easements or densely wooded areas. Plans shall include a restoration schedule specifying the quantity, common and botanic names, sizes, and spacing of trees to be planted and the type of seed mixtures to be used from station to station. Trees to be replaced should be trees native to New Jersey suitable for the particular site and generally should conform to the list of trees found in the current "Standards for Soil Erosion and Sediment Control in New Jersey," prepared by the New Jersey State Soil Conservation Committee, incorporated herein by reference, as amended and supplemented.
 7. In landscaped areas, environmental features shall be replaced or restored to pre-disturbance condition or better. This includes sodding, replacement of trees and shrubs, fences, drives, and other landscape features in kind.

3.05 PROHIBITED CONSTRUCTION PROCEDURES

- A. Prohibited construction procedures include, but are not limited to, the following:
1. Dumping of spoil material into any stream corridor, any wetlands, any vernal habitats, any surface waters, any sites listed or eligible for listing on the New Jersey or National Registers of Historic Places, or at unspecified locations;

2. Indiscriminate, arbitrary or capricious operation of equipment in any stream corridors, wetlands, or surface waters;
3. Pumping of silt-laden water from trenches or other excavations into any surface waters, stream corridors, wetlands, or vernal habitats;
4. Damaging vegetation adjacent to or outside of the access road or the right-of-way;
5. Disposal of trees, brush and other debris in any stream corridors, wetlands, vernal habitats, surface waters, or at unspecified locations;
6. Permanent or unspecified alteration of the flow line of any stream.
7. Open burning of project debris.
8. Use of calcium chloride, petroleum products or other chemicals for dust control; and
9. Use of asphaltic mulch binders; and
10. Any unpermitted discharge of sewage.

3.06 WETLANDS

- A. Construction in wetlands shall conform to requirements of the New Jersey Freshwater Wetlands Protection Act, N.J.S.A. 13:9B-1 et. seq., and N.J.A.C. 7:7A; requirements imposed through applicable permits and, at a minimum, the following:
 1. Before excavation is initiated in the wetlands, a line of hay bales or other siltation control barriers shall be staked in place along the edges of the construction area and shall remain in place until restoration is complete. In addition, marsh mats shall be used for heavy construction equipment.
 2. Topsoil shall be stripped and soil layers replaced in the excavated area in the same order that they were removed. Final grade shall match the elevation prior to disturbance.
 3. The cleared easement shall be re-vegetated with a mix and density of species 'similar to that which was removed. Material for vegetation can be preserved from the areas cleared and replanted or provided from nursery stock.
 4. Anti-seep collars shall be installed as needed in the trench to avoid draining the wetland.
 5. Coastal wetland areas disturbed during the construction shall be restored to pre-disturbance conditions by an environmentally oriented concern with documented successful experience in the restoration of wetland areas.

3.07 STREAM CROSSINGS

- A. Stream crossings shall conform to the requirements of the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et. seq., and N.J.A.C. 7:13.

- B. Where stream crossings are necessary, adverse impacts shall be minimized by including appropriate mitigating measures and restoration techniques. At a minimum, mitigating measures and techniques shall include the following requirements
1. Avoid clearing until immediately preceding construction.
 2. Prior to clearing, place staked hay bales across the sloped approach to the crossing and maintain, except during actual crossing, until restoration is complete.
 3. Avoid stockpiling material in the floodplain of the stream.
 4. Set up in-stream sediment controls prior to commencing construction.
 5. Complete crossing expeditiously. Consider weather and anticipated stoppages for weekends and holidays and plan to cross at such a time that the work can be continued until complete.
 6. Maintain effectiveness of sediment control features throughout the crossing process.
 7. Construction through stream corridors, wetlands and other surface waters shall be scheduled to minimize damage to fish populations wherever possible. Recommended periods during which construction is to take place shall be in accordance with N.J.A.C. 7:13-5.6(g) and N.J.A.C. 7:7E.
 8. Restoration shall be initiated immediately following the crossing and be completed as soon as possible. Restoration shall conform to the following:
 - a. Re-establishing channel contours.
 - b. Replacing bottom with native material, or in very silty bottoms, with crushed stone (one through three-inch diameter).
 - c. Stabilizing banks with rip-rap. The size and nature of the rip-rap shall conform to the current "Standards for Soil Erosion and Sediment Control in New Jersey", prepared by the New Jersey State Soil -Conservation Committee. Jute mesh may be used to stabilize intermittent or extremely low flow streams with shallowly sloping banks in sand/silt bottomed streams.
 - d. Re-vegetating banks with appropriate native materials such as grasses, ground covers, trees and shrubs.

3.08 STEEP SLOPES

- A. Slopes exceeding 15 percent require special treatment. Measures such as water diversion berms, sodding, or the use of jute or excelsior blankets should be used as appropriate. Hay bales shall be placed at the base of the slope prior to ground disturbance. Steep slopes that have been disturbed, if not sodded, shall be seeded and mulched immediately after construction is complete. Slope boards or other measures necessary to prevent slumping of the disturbed slope shall be incorporated, where appropriate.

3.09 ACID PRODUCING SOILS

- A. If there is a possibility of encountering acid-producing deposits in the course of construction, as identified during the planning process, the following special requirements and conditions will apply:
1. In vegetated areas, the top two feet of soil shall be stripped and stockpiled separately from the material to be excavated. A soil specialist, to be provided by the Owner, shall monitor the stripping operation. If any acid-producing deposits are identified, this material and any contaminated soil shall be disposed of on the same day. The presence of acid-producing deposits is detected by the use of the following tests:
 - a. Determining the pH of the soil when suspended in 0.5 Molar calcium chloride solution (of neutral pH). A pH value below 3.0 indicates presence-of ferrous sulfate and presence of acid-producing deposits is strongly suspected.
 - b. Test for sulfate by adding a drop of 10 percent barium chloride solution to a water extract of the material. If voluminous flocks of barium sulfate form immediately the presence of acid-producing deposits is strongly suspected.
 2. The disposal site shall be approved by the Owner and the New Jersey Department of Environmental Protection. Any soil of this type disposed of shall be covered with a minimum of two feet of cover to prevent rapid oxidation and subsequent acid formation.
 3. In both vegetated and paved areas, when acid-producing deposits are encountered, as determined by the soil specialist, excavated trench material shall be returned to the trench as follows:
 - a. Lower material first, followed by upper material.
 - b. The top one to two inches of soil on which the deeper soil was stockpiled shall be scraped and placed below a depth of two feet.
 - c. For pipeline construction, the quantity of material to be displaced by bedding and pipe, as well as soil scraped from the stockpile area, shall be subtracted from the deeper, excavated material and this quantity of deeper material removed to an approved disposal site and covered as described in the "Restoration Measures."
 - d. After backfilling the deeper soil, one ton of limestone per 2,000 square feet shall be spread over the deeper soil in the trench. This liming requirement is applicable in areas of well drained, nonsaturated soils, as determined by the soil specialist.
 - e. In vegetated areas, the top two feet of soil, stockpiled for this purpose, shall then be replaced. If the top two feet of soil was also contaminated, clean backfill material similar to the native topsoil shall be used in place of the contaminated material.
 4. The excavated acid-producing deposits shall not be exposed for a period longer than eight hours. When acid-producing deposits are encountered, the trench opened in any construction day shall be backfilled and the areas cleaned up by the close of the day. Where this is impracticable, such as in the construction of pumping stations and treatment plants, exposed acid-producing deposits shall be covered with limestone screenings at a rate of 100 tons per acre and then covered with six inches of compacted soil within one

week of exposure or before the exposed soil drops to pH 3, whichever occurs first. The pH shall be monitored daily under this procedure.

5. Temporary restoration of vegetated areas shall consist of mulching and shall be put in place at the end of each day's construction. Permanent restoration of the area shall begin as soon as construction is complete and after the results of incubation tests, where necessary, are available.
6. Prior to restoring vegetated areas, the soil specialist shall perform pH tests on the in-situ soil after the construction is completed. If the pH is below 4, intensive liming shall be required in order to make the soil suitable for plant survival.
7. Lime requirement tests shall be performed by the soil specialist to determine the lime application rates. This will require an incubation test in which the sample is oxidized for a period of six weeks, as follows.
 - a. The sample shall be air dried and ground so that the whole sample passes a 0.5-millimeter sieve.
 - b. The lime requirement to reach pH 6.5 shall be determined initially and again at two-week intervals for six weeks, using standard soil testing techniques.
 - c. The total lime requirement determined by this method can be extrapolated to the area under consideration.
8. At a minimum of 30 tons of limestone per acre or the amount of lime required according to the incubation test result shall be applied prior to seeding and planting where the pH is less than 4. Where the pH is greater than 4, liming and fertilizing requirements set out in the planting and environmental specifications shall apply.
9. The spreading and mixing of the subsoil and any topsoil contaminated with acid-producing deposits around the site and beyond the site is prohibited. Areas used for stockpiling acid-producing deposits shall be minimized. Equipment used for excavation and backfilling shall be cleaned, to the extent practicable, at the end of each day's operation and the soil removed shall be placed in the trench below a depth of two feet. No construction shall take place during significant rainstorms or while the area is saturated to avoid smearing or spreading of the acid-producing deposits over the area.

3.10 DEWATERING

- A. When dewatering will occur and a dewatering permit is not required, the Contractor shall monitor for adverse effects to structures or wells due to dewatering and shall be responsible to remedy same to the satisfaction of the Owner and the New Jersey Department of Environmental Protection. Discharges from dewatering activities which contain silt are subject to the following controls:
 1. All discharges from dewatering activities to surface waters, wetlands, vernal habitats, or storm sewers shall be free of sediment. Care shall be taken not to damage or kill vegetation by excessive watering or by damaging silt accumulation in the discharge area. If discharges are sediment laden, techniques shall be employed to remove sediment prior

to discharge. A sedimentation basin shall be constructed and used as specified, where necessary, to protect vegetation and to achieve environmental objectives.

2. Sewer inlets within construction areas shall be provided with perimeter hay bales or other appropriate siltation control measures.

3.11 STOCKPILING, STORAGE, AND DISPOSAL

- A. Requirements with regard to the location and control of stockpile, storage and disposal areas, whether provided by the Owner or the Contractor, must conform to the following:
 1. Only environmentally suitable stockpile sites may be used for the purposes of staging or storing materials, equipment and suitable trench backfill material. Environmentally suitable sites must be level, and devoid of mature stands of natural vegetation. Drainage facilities and features, wetlands, vernal habitats and stream corridors are not environmentally suitable sites.
 2. The boundary of all stockpile areas shall be clearly marked by hay bales, silt fencing or another appropriate method. Where fill is to be stored in excess of 10 days, a suitable means of protecting excavated material from wind and water erosion shall be employed. Erosion control methods may include one or more of the following: mulching, sprinkling, silt fencing, haybaling and stone covering.
 3. Excess excavated material which is not considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be graded on-site only to the extent needed to achieve pre-construction grade, unless otherwise specifically approved by the Owner and the New Jersey Department of Environmental Protection. The Contractor shall remove the remainder from the site and dispose of it at a site approved by the Owner in accordance with the following:
 - a. Disposal sites selected by the Contractor shall be evaluated and approved by the Owner prior to their use. Disposal sites may also be selected by the Owner. The Owner may conduct periodic inspection of disposal sites to ensure compliance with the requirement of this subsection during the off-site disposal operation.
 - b. The disposal of excess excavated material in wetlands, vernal habitats, stream corridors and floodplains is strictly prohibited, even if the permission of the property owner is obtained.
 - c. The Contractor shall be responsible to remove any fill improperly placed by the Contractor at the Contractor's expense and restore the area impacted.
 - d. If excess excavated material is placed on private property, a hold harmless release in favor of the Owner and New Jersey Department of Environmental Protection shall be obtained from the property owner.
 - e. Prior to approval of a site for excess excavated material disposal, where the site exceeds 5,000 square feet, the Contractor shall obtain the appropriate certification of the soil erosion and sediment control plan in accordance with the State's standards for soil conservation (N.J.S.A. 4:24-1 et. seq. also referred to as Chapter 251) and submit same to Owner. Where the site is less than 5,000 square feet, the Contractor shall on

behalf of and with a copy to Owner advise the property owner of the need for erosion and sediment control and obtain a statement that the property owner accepts complete responsibility for implementation of appropriate methods to prevent erosion and sedimentation.

3.12 DUST

- A. In order to control dust, as often as required during each working day, and particularly prior to the conclusion of each working day, areas under immediate construction (including access roads and other areas affected thereby) shall be swept and wet down with water sufficiently to lay dust. In addition, these areas shall be wet down during non-working hours (including weekends) as often as required to keep the dust under control. The use of calcium chloride or petroleum products or other chemicals for dust control is prohibited.
- B. Maintain dust control throughout entire construction period including non-working hours (including weekends) by use of water sprinklers as approved by Engineer. Coatings on structures located on private property, resulting from failure to control dust, will be removed promptly at no additional expense.
- C. The Contractor will be required to maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded, and which would cause a hazard or nuisance to others.
- D. Sprinkling must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

3.13 NOISE

- A. In order to limit noise impacts in the vicinity of sensitive receptors, construction operations and activities shall be limited as follows: Monday through Friday between the hours of 7:00 A.M. and 6:00 P.M. unless variances to these times are granted in times of emergency. No driving, pulling, or other operations entailing the use of vibratory hammers or compactors shall be permitted, other than between the hours of 8:00 A.M. and 5:00 P.M. The number of machines in operation at a given time shall be limited to the minimum practicable. All engine generators or pumps must have mufflers and be enclosed within a temporary structure.
- B. The Contractor shall make every effort to minimize noises caused by his operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with NJAC State and Federal regulations. Boilers shall be equipped with insulated enclosures for noise reduction.

3.14 CULTURAL RESOURCES

- A. If a cultural resource is encountered during the course of construction, the Contractor is directed to halt all construction activities in that area. The Contractor shall immediately contact the Engineer and the Engineer who shall contact the New Jersey Department of Environmental Protection. The Department will determine and require initiation of the appropriate actions in conformance with N.J.A.C. 7:22-10.8.

- B. The Contractor shall not dispose of excess excavated material at, stockpile construction materials at, or obtain borrow material from, properties which are listed or eligible for listing on the New Jersey or National Registers of Historic Places.
- C. If unexpected archaeological resources are encountered during construction, the Contractor must immediately halt all construction the vicinity of the discovery and contact the Owner.
- D. When the Owner is contacted by the Contractor in accordance with the above provisions, the Owner must immediately contact NJDEP-Municipal Finance and Construction-Technical Services at (609) 292-8961 or (609) 633-1170. The Bureau of Program Development & Technical Services will determine the appropriate actions, in accordance with NJAC 7:22-10, and federal Advisory Council on Historic Preservation procedures.

3.15 ENVIRONMENTAL MAINTENANCE BOND

- A. The Contractor shall supply an environmental maintenance bond in the amount of \$25,000 or 50 percent of the price bid for the materials needed to fulfill the environmental specifications, whichever is greater. The environmental maintenance bond shall provide that the Contractor shall remedy, without cost, any defects which result from faulty workmanship or from failure to comply with the specifications and which develop during the period of one year from the expiration of the performance bond, required pursuant to N.J.S.A 40A:11-22.

3.16 PHOTOGRAPHS

- A. The Contractor shall obtain and submit to the Engineer photographs of existing conditions prior to the start of site and access clearing and construction. At a minimum, one 8 inch by 10-inch color glossy print photograph shall be obtained for each 100 feet of the construction area. Special attention shall be given to environmentally critical areas and areas outside of the public right-of-way. Photographs shall be labeled by station so that upon completion of the construction, or during construction if necessary, subsequent photographs can be taken from the same control points. The Engineer shall file copies of the above photographs with the New Jersey Department of Environmental Protection. As a supplement to the required photographs, video documentation may be submitted by the Contractor to the Engineer, as is encouraged as a way of documenting site conditions.

3.17 PROTECTION OF STREAMS

- A. Care shall be taken to prevent, or reduce to a minimum, any damage to any stream from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Such waters will be diverted through a settling basin or filter before being directed into the streams.
- B. The Contractor shall not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.
- C. All preventative measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken.

3.18 PROTECTION OF LAND RESOURCES

- A. Land resources within the project boundaries and outside the limits of permanent work shall be restored to a condition, after completion of construction, which will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.
- B. Outside of areas requiring earthwork for the construction of the new facilities, the Contractor shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.
- C. Where trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment, dumping or other operations, protect such trees by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly before beginning operations near them.
- D. Any trees or other landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition. The Engineer will decide what method of restoration shall be used and whether damaged trees shall be treated and healed or removed and disposed of.
 - 1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-inch in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.
 - 2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer, shall be immediately removed and replaced.
- E. The locations of the Contractor's storage, and other construction buildings, required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and shall require written approval of the Engineer and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites. Drawings showing storage facilities shall be submitted for approval of the Engineer.
- F. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least ten days prior to scheduled start of such temporary work.
 - 1. A layout of all temporary roads, excavations and embankments to be constructed within the work area.
 - 2. Details of temporary road construction.

3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.
 4. A landscaping drawing showing the proposed restoration of the area. Removal of any trees and shrubs outside the limits of existing clearing area shall be indicated. The drawing shall also indicate location of required guard posts or barriers required to control vehicular traffic passing close to trees and shrubs to be maintained undamaged. The drawing shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.
- G. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the Engineer. Restore disturbed areas as shown on the Drawings and/or as specified.
- H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.19 PROTECTION OF AIR QUALITY

- A. Burning. The use of burning at the project site for the disposal of refuse and debris will not be permitted.
- B. Dust Control. Refer to Article 3.12 of this Section.
- C. Odors that emanate from open manholes shall be mitigated by ventilating manholes with forced-air blowers. If necessary to correct the problem upstream and downstream manholes shall also be ventilated.

3.20 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

- A. During the life of this Contract, maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

END OF SECTION

SECTION 01170

SPECIAL PROVISIONS

PART 1: GENERAL

1.01 SLEEVES AND OPENINGS

- A. Provide all openings, channels, chases, etc and install anchor bolts and other items to be embedded in concrete, as required to complete the work under this Contract, together with those required by subcontractors and perform all cutting and patching, excepting cutting and patching of materials of a specified trade and as stated otherwise in the following paragraph.
- B. Subcontractors shall furnish all sleeves, inserts, hangers, anchor bolts, etc, required for the execution of their work. It shall be their responsibility before the work of the Contractor is begun to furnish him with the above items and with templates, drawings or written information covering chases, openings, etc, which they require and to follow up the work of the Contractor as it progresses, making sure that their drawings and written instructions are carried out. Failing to do this, they shall be responsible for the cost of any corrective measures which may be required to provide necessary openings, etc. If the Contractor fails to carry out the directions given him, covering details and locations of openings, etc, he shall be responsible for any cutting and refinishing required to make the necessary corrections. In no case shall beams, lintels, or other structural members be cut without the approval of the Engineer.

1.03 IDENTIFICATION

- A. The Contractor shall prepare an identification system as required by Section 01340.

1.04 SPARE PARTS

- A. Furnish all spare parts recommended by the manufacturer or system supplier for one year of service. In addition, furnish all spare parts itemized in each Section.
- B. Collect and store all spare parts in an area to be designated by the Engineer. Furnish the Engineer with an inventory listing all spare parts, the equipment they are associated with, the name and address of the supplier and the delivered cost of each item. Copies of actual invoices for each item shall be furnished with the inventory to substantiate the delivery cost.
- C. Spare parts shall be packed in cartons, properly labeled with indelible markings with complete descriptive information including manufacturer, part number, part name and equipment for which the part is to be used and shall be properly treated for one year of storage.
- D. A Spare Parts Turnover Form shall be completed for each piece of equipment provided for this project. The Form to be completed is appended to this section.

END OF SECTION

SECTION 01171
ELECTRIC MOTORS TO 250 HP

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Random wound, NEMA frame motors up to 250 HP furnished under other Sections shall comply with the requirements listed in this Section.
- B. Motors connected to Variable Frequency Drive Controllers shall be designed for inverter duty.

1.02 RELATED WORK

- A. Section 16020 - Electrical

1.03 SUBMITTALS

- A. Submit motor nameplate data and test characteristics per NEMA Standard MG1-12.54 "Report of Test Form for Routine Tests on Induction Motors" in accordance with Section 01300 – Submittals, including:
 - 1. Efficiency at 1/2, 3/4 and full load
 - 2. Power factor at 1/2, 3/4 and full load
 - 3. Motor outline, dimensions and weight
 - 4. Descriptive bulletins, including full description of insulation system
 - 5. Bearing design data
 - 6. Special features (i.e., space heaters, temperature detectors, etc.)
 - 7. Power factor correction capacitor rating and type.

1.04 REFERENCE STANDARDS

- A. American Bearing Manufacturers Association (ABMA)
 - 1. ANSI/ABMA 7 - Shaft and Housing Fits for Metric Radial Ball and Roller Bearings (Except Tapered Roller Bearings) Conforming to Basic Boundary Plans [1995]
 - 2. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings [1990]
 - 3. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings [1999]
- B. American National Standards Institute (ANSI)
 - 1. ANSI/NCSL Z540-1 - Calibration Laboratories and Measuring and Test Equipment, General Requirements [1994]

C. American Society for Testing Materials (ASTM)

1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) apparatus [1997]

D. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE 1 - Recommended Practice - General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation of Electrical Insulation [2000]
2. IEEE 43 - Recommended Practice for Testing Insulation Resistance of Rotating Machinery [2000]
3. IEEE 85 - Test Procedures for Airborne Sound Measurements on Rotating Electric Machinery [1986]
4. IEEE 112 - Standard Test Procedure for Polyphase Induction Motors and Generators [2004]
5. IEEE 792 - Recommended Practice for the Evaluation of the Impulse Voltage Capability of Insulation Systems for AC Electric Machinery Employing Form-Wound Stator Coils [1995]
6. IEEE 841 - Standard for Petroleum and Chemical Industry - Severe Duty Squirrel Cage Induction Motors - Up to and Including 500 HP [2001]

E. International Organization for Standardization (ISO)

1. ISO 10012-1 - Quality assurance requirements for measuring equipment [1990]
2. ISO 1940-1- Mechanical Vibration, Balance Quality Requirements of Rigid Rotors [1986]
3. ISO 1940-2 - Determination of Permissible Residual Unbalance [1997]
4. ISO 10816-1- Mechanical Vibration, Evaluation of Machine Vibration by Measurements on Non-Rotating Parts - Part 1: General Requirements [1995]
5. ISO 9001- Quality Management Systems - Requirements [2001]

F. National Electrical Manufacturers Association (NEMA)

1. NEMA MG1 - Motors and Generators [2006]
2. NEMA MG2 - Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators [2001]
3. NEMA MG3 - Sound Level Prediction for Installed Rotating Electrical Machines [2000]
4. NEMA MG10 - Energy Management Guide for selection and use of Polyphase Motors [1999]

G. National Fire Protection Association (NFPA)

1. NFPA 70 - National Electric Code [2005]

H. Underwriters Laboratories (UL)

1. UL 674 - Motors and Generators, Electric, for Use in Hazardous Locations, Class I - Groups C and D, Class II - Groups E, F and G.

I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. Motors shall be listed under UL recognized component file as applicable.

B. The motor manufacturer shall maintain a documented ISO 9001 quality assurance program implementing suitable procedures and controls to monitor all aspects of production and testing.

C. Motor manufacturer shall maintain authorized service centers capable of providing training, parts, and emergency maintenance and repairs.

D. Electric motors driving identical machines shall be identical.

1.06 SYSTEM DESCRIPTION

A. To assure unity of responsibility, the motors shall be furnished and coordinated by the manufacturer of the driven equipment. The Contractor shall assume responsibility for the satisfactory installation and operation of the entire system as specified.

B. When electrically driven equipment differs from that indicated, adjust the motor size, wiring and conduit systems, disconnect devices, and circuit protection to accommodate the equipment actually installed, without additional cost.

1.07 DELIVERY, STORAGE AND HANDLING

A. Motors shall be shipped fully assembled with the driven equipment. Provide storage and handling per motor manufacturer's installation instructions and Section 01600 – Delivery, Storage and Handling.

B. When furnished, energize motor space heaters to prevent moisture condensation throughout the storage and construction period. Perform periodic motor insulation resistance tests per manufacturer's storage recommendation.

C. Maintain the bearings during storage and construction, and periodically rotate the motor shaft according to manufacturer's instructions.

1.08 PROJECT/SITE REQUIREMENTS

A. Power supply: 480 VAC, three phase, 60 hertz as indicated for 1/2 Hp and above;

- B. Environmental Requirements: unless otherwise stated, suitable for continuous duty operation without derating under the following service conditions:
 - 1. Environment: Wastewater treatment plant indoor or outdoor applications involving severe duty conditions such as high humidity or chemical laden, corrosive or salty atmospheres.
 - 2. Area classification: as indicated on the drawings.
 - 3. Maximum ambient temperature: 40 degrees C.
 - 4. Altitude: up to 3300 feet above MSL.
- C. Coordination:
 - 1. Coordinate motor installation and equipment layout with conduit and wiring, piping, other machinery equipment, and adjacent surfaces. Maintain required access clearances for cooling air, conduit box, lubrication and coupling.
 - 2. Coordinate size and location of concrete pads for motors and equipment soleplates.
 - 3. Coordinate voltage and current ratings of motors and accessories such as space heaters with power supply characteristics, and overcurrent and overload protective devices per the NEC.
 - 4. Coordinate winding and bearing protective devices with ratings and characteristics of monitoring equipment circuits to which they connect. Coordinate control sequences and temperature setpoints.

1.09 WARRANTY

- A. Warranties: in accordance with Section 01740 - Warranties And Bonds] but extended as follows:
 - 1. Inverter duty motors: warranted for 36 months on inverter power.

1.10 DEFINITIONS

- A. Definition of terms used in this specification shall be in accordance with NEC Article 100, ANSI/IEEE Standard 100, and UL Standards Glossary.
- B. Definitions of Enclosure Types for Motors
 - 1. ODP - Open Drip-Proof
 - 2. TEFC - Totally-Enclosed, Fan-Cooled
 - 3. TEAO - Totally-Enclosed, Air Over
 - 4. TEXP - Totally-Enclosed, Explosion-Proof
 - 5. IP-22 - Open Drip-Proof

6. IP-44 - Totally-Enclosed
7. IP-54 - Splash Proof
8. IP-55 - Washdown

PART 2: PRODUCTS

2.01 GENERAL

- A. Torque output: minimum performance characteristics for locked rotor and breakdown torque with rated voltage and frequency applied as defined by NEMA MG1, to accelerate and operate the load throughout its operating speed range, including conditions imposed by reduced voltage starting methods.
- B. Motors shall deliver the specified performance at rated load under the combinations of voltage and frequency variations and voltage unbalance specified in NEMA MG1.
- C. Horsepower rating: sized for operation within the full load nameplate rating without applying the service factor, throughout the full range of mechanical or hydraulic operating condition.
- D. Service Factor: 1.15 service factor on sine wave power and 1.0 service factor on VFD power in a 40 degree C ambient.
- E. Specific motor application data such as Hp, rpm, enclosure type, etc., is specified under the detailed driven mechanical equipment specification.
- F. Enclosures: conform to one of the following NEMA standard enclosure designs as specified under the detailed driven mechanical equipment specification. If no enclosure type is specified, provide TEFC enclosures:
 1. Open Drip Proof (ODP)
 2. Totally Enclosed Fan Cooled (TEFC)
 3. Totally Enclosed Explosion Proof (TEXP)
- G. Nameplates: engraved or embossed on stainless steel 316 L alloy fastened to the motor frame with stainless steel 316 L alloy screws or drive pins with information per NEMA MG1.

2.02 SINGLE-PHASE MOTORS

- A. Application: motors smaller than 1/2 Hp shall be 115/230 or 208 Volts single phase, continuous heavy duty, reversible, capacitor start. Small fan motors may be split-phase or shaded pole type if such are standard for the equipment. Wound rotor or commutator type single-phase motors are not acceptable unless their specific characteristics are necessary for the application.
- B. Overload protection: provide internal automatic thermal overloads unless otherwise noted.

- C. Insulation: Class F or better, with Class B temperature rise, 1.15 service factor. Locked rotor current shall not be greater than specified in NEMA Standard MG1, Design "N".
- D. Enclosure: provide fully gasketed, totally-enclosed air over or fan cooled in conformance with NEMA Standard MG1. Small fan motors may be open type if suitably protected from moisture, dripping water and lint accumulation.
- E. Washdown duty: Where motor is installed in wet or corrosive areas routinely exposed to washdowns, high humidity or caustic chemicals, provide stainless steel 316 L alloy, paint free washdown motors with Inpro bearing isolators, stainless steel 316 L alloy T-type condensation drains, nitrile conduit box gasket, and corrosion resistant fans.
- F. Bearings: sealed ball bearings permanently lubricated for 10 years normal use, furnished with shaft slinger.
- G. Class 1, Division 1 and 2 locations: Single phase motors installed in Class 1, Division 1 and 2 locations shall be explosion proof, marked with a T3B temperature code label, and UL listed for use in Class 1, Division 1, Groups C & D, and Class II, Groups E, F, & G hazardous location. The temperature code marking shall appear on the nameplate.

2.03 THREE-PHASE INDUCTION MOTORS

A. Applications

- 1. Energy efficiency: meet or exceed requirements of NEMA MG1 Part 12 for NEMA Premium Efficient motors, for 1 Hp and larger. Where State Energy Codes or Utility Company Energy Rebate Programs dictate higher efficiencies than those listed, comply with the more stringent standard.
- 2. Severe duty: Motors installed in process areas and wet or corrosive locations shall be of a type designated by the manufacturer as "Corro Duty", "Mill and Chemical", "Severe Duty", or similar quality designation. [Motors shall also comply with IEEE 841].
- 3. Class 1, Division 2 locations: Motors in Class 1, Division 2 locations shall be marked with a temperature code label suitable for use in the hazardous area classification where installed. Motors shall also comply with IEEE 841 severe duty requirements, with the following additional requirements:
 - a. The Class, Group and Temperature Code shall be one of the following:
 - b. Class I Group D - T2B (260°C)
 - c. Class I Group D, Class II Groups F and G - T3B (165°C)
 - d. Class I Groups C and D, Class II Groups F and G - T3C (160°C)
 - e. Thermostats: Where winding thermostats are used to obtain surface temperature limitation, the thermostats shall be connected in series with the starter holding coil (stop button). Winding temperature detectors and switches shall be UL listed for use in Class 1, Division 1 locations.
 - f. The exposed surface of motor condensation heaters shall not exceed 80 percent of the nameplate temperature code value.
 - g. Ventilation fan shall be constructed of corrosion-resistant, non-sparking material such as bronze.

4. Class 1, Division 1 locations: Motors installed in Class 1, Division 1 locations shall be explosion proof, temperature code T3C (160°C), listed for use in Class 1, Division 1, Group C & D locations in accordance with UL 674. The operating temperature or temperature range marking shall appear on the nameplate, indicating the maximum temperature for all conditions including overload, locked rotor and single-phasing.
5. Inverter Duty: Motors connected to Variable Frequency Drive Controllers shall be designed for inverter duty and shall comply with the following:
 - a. Definite purpose: Motors operated on variable frequency drives shall be designed specifically for inverter duty, per NEMA MG1, Part 31, and comply with IEEE 841. Motors shall be designed for constant or variable torque over the speed range required by the driven equipment application. Motors shall be capable of across the line starting at the motor minimum terminal voltage with an acceptable maximum locked rotor current.
 - b. Torsional critical speed: first or second torsional shall not be encountered within the operating speed range. Rotors shall be stiff shaft design, statically and dynamically balanced with the first lateral critical speed at least 15% above the maximum running speed.
 - c. Thermal protection: provide three internal bi-metallic, temperature actuated switches, unless other type of thermal protective device is specified in the mechanical equipment section.
 - d. Cooling provisions: maintain temperature rises at design levels while operating throughout the speed range. Ventilation system shall be designed for maximum heat transfer including larger fans or auxiliary cooling fans to maintain proper low speed cooling.
 - e. Inverter grade insulation system: minimum Class F or better insulation materials with additional phase insulating material, extra end-turn bracing and Class H spike resistant wire. The resultant system shall withstand up to 2000 volt transients without premature motor failure and have no cable limitations in motor application.
 - f. Motor shaft currents: insulate the ODE bearing and provide a shaft grounding strap. Insulate bearing probes to prevent shorting out bearing insulation.

B. Construction

1. Stator core: built up, fully processed, high grade, low loss silicon steel laminations keyed or dovetailed to the stator frame and securely held in place at each end.
2. Stator winding: assembled using random wound copper coils. A split component epoxy insulation system shall be used in order to provide high resistance to moisture and other contaminants.
3. Insulation: manufacturer's premium grade non-hygroscopic, chemical and humidity resistant insulation system consisting of Class F or H materials, operated at Class B temperature rise, with at least one impregnation cycle using solventless resin, and multiple additional dip and bake cycles using polyester varnish.
4. Motor leads: non-wicking type, minimum Class F temperature rating and permanently numbered for identification.

5. Rotor shaft: forged or rolled steel, accurately machined, smoothly finished, with sufficient strength to withstand all stresses resulting from normal operation at any speed up to and including a 25 percent overspeed condition. Coordinate shaft end details with driven equipment coupling.
6. Rotor core: solid, built-up stack of fully processed and coated, high-grade, low-loss silicon steel laminations, with die cast aluminum or fabricated copper bars or their respective alloys. Rotors on frames 213T and above shall be keyed to shaft and rotating assembly dynamically balanced.
7. Cooling fan: corrosion-resistant, bi-directional, keyed, clamped and shouldered on the shaft.
8. Rotor assembly: coated with a corrosion resistant epoxy insulating varnish or other protective coating, thermally stable, statically and dynamically balanced. Balance weights shall be securely attached to the rotor resistance ring by welding or similar permanent method.

C. Bearings

1. Horizontal Bearings
 - a. Bearings: anti-friction open or single-shield, vacuum-degassed steel ball or roller bearings, electric motor quality. Metric size bearings are not acceptable.
 - b. Maximum bearing temperature rise: 50 degrees C for two pole motors, 45 degrees C for all other motors, measured at rated load by RTD or thermocouple at bearing outer race.
 - c. Lubrication: factory lubricated with a premium moisture resistant polyurea thickened grease containing rust inhibitors and suitable for operation over temperatures from -30 to 150 degrees C. with standard lube and relief fittings for re-greasing external lubrication while machine is in operation. Motors shall be NEMA size 140 frame motors and smaller than may be permanently lubricated.
 - d. Minimum Rated fatigue life: L10 life of 100,000 hours per ABMA 9 or ABMA 11 for direct coupled applications and 26,000 hours for belted applications based on NEMA belting application limits per NEMA MG1. Severe duty motors shall have increased bearing life of 150,000 hours for direct coupled applications and 50,000 hours for NEMA belted applications per IEEE 841.
 - e. Shaft seals: prevent grease leakage and the entrance of foreign materials, such as water and dirt, into the bearing area while running, coasting, or at rest. Severe duty motors shall have improved sealing per IEEE 841.
2. Vertical Bearings
 - a. Bearings: manufacturer's standard design, constructed with thrust bearings on top to allow inspection and/or replacement without requiring complete disassembly of motor, of type and size to satisfy thrust loading requirements, rated for an in-service B-10 life of 8800 hours per ABMA, designed to support the weight of the rotor plus, if required, the weight of the rotating driven equipment parts and the hydraulic thrust created by the driven equipment, with a 40 degrees C maximum temperature rise. Metric bearings are not acceptable.
 - b. Coordinate all thrust conditions, including shutoff, and shaft requirements with the manufacturer of the driven equipment.

- c. Normal thrust applications: use grease lubricated deep-groove ball type thrust bearings only on normal thrust design motors, capable of handling thrust loads in either direction.
- d. High thrust applications: use single or multiple angular contact ball bearings. Anti-friction thrust bearings shall be designed for an L10 life of 100,000 hours including rotor weight. For applications with higher thrust loads which cannot meet the L10 life, spring loaded spherical roller thrust bearings may be used.
- e. Guide bearings: deep-groove ball type located at the bottom of the motor, capable of withstanding all stresses incident to the normal operation of the unit and to the specified overspeed condition, with sufficient means for preventing the leakage of lubricant or entrance of foreign matter along the shaft. When furnished as guide bearings for high thrust units, they shall be oil lubricated. Hollow shaft motors shall have a steady bushing to support the head shaft at the lower end of the motor.
- f. Grease lubricated bearings: furnished with provisions for in-service positive lubrication and a drain to guard against over lubrication.
- g. Oil lubricated bearings: contained in an oil reservoir with sight level gauge, fill and drain openings with plugs, designed to prevent leakage and excessive aeration of the oil.
- h. Anti-backspin device: when specified or requested by the pump manufacturer, provide a shaft mounted, mechanical non-reverse ratchet rated at 100 percent of motor full load torque for immediate protection against reversing due to phase reversals or from backspin at shutdown.

D. Enclosures

- 1. Motor frames: cast iron or welded heavy plate steel construction, stiff enough to withstand the rotating forces and torques generated and shall be designed to limit or avoid any undesirable harmonic resonances. Provide a threaded, forged steel, shouldered eyebolt blind tapped into the motor frame for lifting.
- 2. Condensate drain openings: locate drain holes at the low points in the end brackets to allow removal of accumulated moisture from enclosures. Provide corrosion resistant, breather drain plugs for severe duty motors.
- 3. Enclosure type: as specified in the mechanical equipment section, designed in accordance with NEMA MG1. Totally enclosed designs shall be suitable for outdoor use.
- 4. Hardware: hex head, SAE Grade 5 or better, plated for corrosion protection.
- 5. Main terminal box: fabricated steel or cast iron, sized per the NEC for number and size of conduit connections as indicated on the drawings, arranged to accommodate conduit entry from any quadrant, with a grounding terminal and gaskets between the box and motor frame and between the box and its cover.
- 6. Bearing housings: provide machined surfaces for attaching a magnet mounted accelerometer in order to monitor the motor vibration in the vertical, horizontal, and axial directions at each bearing housing.
- 7. Space heaters: provide silicone rubber strip type enclosure heaters for outdoor motors, or where otherwise specified. Heaters shall be rated 120 Volt, single phase, designed to

prevent condensation inside the enclosure when the motor is idle, with leads brought out to the motor terminal box. The heater wattage and voltage shall be embossed on the motor nameplate.

8. Frame grounding: provide motor frame grounding pad or threaded stud where supplemental grounding to frame is indicated on the Drawings.
- E. Accessories: provide where specified under the detailed mechanical specifications for individual equipment:
 1. Winding temperature switch: three, snap action, bi-metallic, temperature actuated switches embedded in the connection end-turns of the motor winding with normally closed contacts and leads terminating in the main conduit box.

2.04 SURFACE PREPARATION AND SHOP COATINGS

A. Cast and Fabricated Components

1. Motor cast iron and fabricated metal components shall be cleaned; free of grease, oil, dirt, or other contaminants; then oxide primed and painted with manufacturer's standard finish coating.
2. Severe duty motors: surpass the 250 hour salt spray test per ASTM B117.

B. Internal Surfaces

1. Internal surfaces: shaft, rotor, end bells and parts shall be covered with a corrosion-resistant coating of epoxy paint or equal material of 2 mils minimum dry film thickness for increased life against adverse environmental conditions. The stator bore and end turns shall be coated with clear epoxy varnish in addition to the insulating varnish treatment.
2. Shaft extension: protected with a rust preventive strippable coating capable of being peeled off or unwrapped.
3. Machined joints and threaded parts: coated with rust-inhibiting compound.

2.05 FACTORY TESTING

- A. Each motor shall be given an unwitnessed routine short commercial test per NEMA MG1 and IEEE 112.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Install the motors per manufacturer's installation instructions.
 1. Prepare rigid foundation or mounting surface to minimize vibration and maintain alignment between motor and load shaft.

2. Align the motor shaft with driven equipment according to manufacturer's written instructions. Adjust axial position of motor frame with respect to load shaft.
3. Accurately adjust flexible couplings for direct drive according to machine manufacturer's guidelines. Check alignment to minimize vibrations. Coupling spacing shall be according to coupling manufacturer guidelines.
4. Anchor motor base to load bearing surface with grade 5 steel bolts or better.

B. Electrical Connections

1. Install motor branch circuit conduits and conductors in accordance with NEC and local code requirements.
2. Terminate the motor leads per the manufacturer's connection diagrams.
3. Install equipment grounding conductors per NEC and local code requirements.
4. Tighten electrical connections and terminals according to manufacturer's published torque values.
5. Install conduit and wiring between motor auxiliary devices and associated indicators, controllers and protective devices in accordance with shop drawings.
6. Connect electro-magnetic field sensitive devices such as RTDs, thermistors, thermal protector switches, and vibration sensors with twisted and shielded instrumentation wiring.
7. When furnished, mount power factor correction capacitor adjacent to the motor and connect to the motor junction box with liquid tight flexible conduit and code sized wiring. For explosion-proof motors, mount the capacitor in a non-hazardous area above or near the MCC.

C. Pre-Commissioning Inspection

1. Inspect for physical damage. Verify all shipping materials and braces are removed.
2. Compare equipment nameplate information with site conditions and report any discrepancies.
3. Inspect for proper mounting, grounding, and wiring connections. Check all hardware for looseness and re-tighten as necessary.
4. Verify that the motor and the coupled load are properly aligned. Inspect bearings for proper lubrication and rotate motor shaft by hand to check for binding. Oil lubricated bearing housings that have been filled with preservative oil shall be drained and re-filled with the proper grade of bearing oil before putting the machine into service.
5. Clean motor externally, on completion of installation. Vacuum dirt and debris; do not use blown compressed air to assist in cleaning.

D. Field Commissioning

1. Perform insulation resistance tests in accordance with manufacturer's instructions. If the test fails consult the manufacturer and dry out the machine.
2. Perform a phase rotation test to ensure proper shaft direction with load uncoupled.
3. Check all connections with wiring diagrams prior to energizing.
4. Inspect for unusual mechanical or electrical noise or signs of overheating during initial test run.
5. Measure running current and evaluate relative to load conditions and nameplate full load amperes.

END OF SECTION

SECTION 01172

PIPE PENETRATIONS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install pipe penetration assemblies where indicated. This Section covers materials for the various pipe penetration configurations.

1.02 RELATED WORK

- A. Piping materials and systems are included in Division 15.

1.03 SUBMITTALS

- A. Submit manufacturers' literature, installation instructions, and where applicable, fire rating and certified test results of the various components on all items to be furnished in accordance with Section 01300.

PART 2: PRODUCTS

2.01 PIPE SLEEVES

- A. Unless otherwise shown all pipe sleeves shall be Schedule 40 galvanized steel pipe conforming to ASTM A53. Where indicated, provide a 2-in minimum circumferential water stop welded to exterior of sleeve at its midpoint. Ends of sleeves shall be cut and ground smooth and shall be flush with the wall or ceiling and extend 2-in above finished floors. Sleeves to be sealed with mechanical seals shall be sized in accordance with the seal manufacturer's recommendations. Sleeves to be sealed by caulking and sleeves for insulated piping shall be sized as required.

2.02 SEALING MATERIALS

- A. Mechanical seals for pipe penetrations shall be modular, adjustable, bolted, mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve. The seal shall be rated by the manufacturer for 40-ft of head or 20 psig. A single seal shall be provided for all sleeve and cores in walls up to 14" thick; dual sleeves shall be provided in larger walls. Bolts and hardware shall be carbon steel, zinc plated. Pressure plates shall be corrosion-resistant acetal resin. Mechanical seals shall be Link-Seal LS-300-M, LS-400-M, or LS-500-M, depending on pipe size, by Thunderline Corp., Wayne, MI or equal.
- B. Sealant shall be a two part foamed silicone elastomer by Dow Corning Co., Product No. 3-6548 silicone R.T.V.; 3M brand fire barrier products caulk C.P. 25 and 3M brand putty 303; or Flame-Safe fire stop systems Fig. No. FS-500 by Thomas & Betts Corp. Sealant bead configuration, depth and width shall be in accordance with manufacturer's recommendations.

2.03 MISCELLANEOUS MATERIALS

- A. Bonding compound shall be Sikadur Hi-Mod epoxy by Sika Corp.; Euclid Chemical Corp.; Master Builders Company or equal.
- B. Non-shrink grout shall be Masterflow 713 by Master Builders Co.; Euco N-S by Euclid Chemical Co.; Five Star Grout by U.S. Grout Corp. or equal.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Assemble and install components of pipe penetration assemblies per manufacturer's recommendations.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 Description of Requirements:

- A. This section specifies the general methods and requirements of submissions applicable to the following work-related submittals: Shop Drawings, Product Data, Samples, Maintenance and Lubrication Schedule/Survey, Certified Shop test Reports, Equipment Manufacturers certification and Mock-Ups. Additional general submission requirements are contained in paragraphs 6.17 of the General Conditions. Detailed submittal requirements will be specified in the technical specification sections.
- B. All submittals shall be clearly identified by reference to Specification Section, Paragraph, Drawing No. or Detail as applicable. Submittals shall be clear and legible and of sufficient size for sufficient presentation of data.
- C. Project Management Software
 - 1. The Passaic Valley Sewerage Commission (PVSC) is using PMWeb as the project management collaborative software tool for this project.
 - 2. The Contractor is required to utilize PMWeb for the duration of this project, including project closeout (i.e. Contract Duration + 90 days) and shall provide all project information via this program. This includes, but is not limited to contracts, applications for payment, change orders, requests for information, submittals, daily reports, etc.
 - 3. The Contractor is required to purchase five (5) full access PMWeb licenses from Critical Business Analysis (CBA) Inc. and maintain the licenses through the duration of this project. These licenses will be assigned by the PVSC or their designated representative to members of the project team. At end of the project, these licenses shall be turned over to the PVSC. The cost for the licenses and support of the licenses shall be borne by the Contractor.
 - 4. The Contractor shall provide for two (2) days of formal PMWeb training for the five full access licensed users as directed by the PVSC or their designated representative. Training will be conducted at the Passaic Valley Sewerage Commission, 600 Wilson Avenue, Newark NJ 07105. The training

shall be coordinated through the PVSC or their designated representative. The cost for the training shall be borne by the Contractor.

5. The Contractor shall contact John Statts at Critical Business Analysis (CBA) Inc. to obtain licenses and training fees at 419•874•0800.
6. PVSC and The Contractor will utilize PMWeb system Workflows as the main project collaboration foundation. All project related documents, not limited to, correspondence, project emails, forms, etc. will be incorporated into the PMWeb.
7. The Contractor will be required to deliver, for all users, information necessary to fulfill PMWeb system requirements. A form will be provided, filled, and returned to PVSC. PMWeb administration will utilize this information for user access rights and workflow protocol.
8. With Program Management Software being a 100% electronic based system Contractor will be required, by PVSC, to submit hardcopies. Hard Copies for all final submittals will still be required as specified within Section 1.04 and Section 1.08.

1.02 Shop Drawings, Product Data, Samples:

A. Shop Drawings

1. Shop drawings, as defined in the General Conditions, and as specified in individual work sections include, but are not necessarily limited to, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the Work.
2. All shop drawings submitted by subcontractors for approval shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.
3. The Contractor shall check all subcontractor's shop drawings regarding measurements, size of members, materials, and details to satisfy himself that

they conform to the intent of the Drawings and Specifications. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission thereof.

4. All details on shop drawings submitted for approval shall show clearly the relation of the various parts to the main members and lines of the structure, and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted for approval.

B. Product Data

1. Product data as specified in individual Sections, include, but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the work.

C. Samples

1. Samples specified in individual Sections, include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the work.

1.03 Contractor's Responsibilities

- A. The Contractor shall review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:
 1. Field measurements.
 2. Field construction criteria.

3. Catalog numbers and similar data.
 4. Conformance with the Specifications.
- B. All submittals, including shop drawings prepared by or under the direction of the Contractor, shall be thoroughly checked by the Contractor for accuracy and conformance to the intent of the Contract Documents before being submitted to the Engineer and shall bear the Contractor's certification with signature of approval certifying that they have been so checked. Submittals without the Contractor's certification with signature of approval, will not be reviewed by the Engineer and will be returned to the Contractor stamped "Rejected." Before submitting them to the Engineer, all submittals shall be bound, properly labeled and consecutively numbered and bear the certification statement, listed below, on the cover sheet for sheets 11" x 17" and smaller or in a clear space above the title block for drawings.

PASSAIC VALLEY SEWERAGE COMMISSION	
NAME OF PROJECT:	Waste Activated Sludge Pumping Station Expansion
Date:	
Contract No.:	A992
Name of Equipment:	
Contract Drawing No.:	
Specification Section:	
<p>I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements and they are hereby approved. The information contained herein has been coordinated with all involved Contractor's.</p>	
Contractor:	
Signed:	

Provide to the Resident Project Representative a copy of each submittal transmittal sheet for shop drawings, product data and samples at the time of submittal of said

drawings, product data and samples to the Engineer.

- C. The Contractor shall utilize a 10-character submittal identification numbering system in the following manner:
1. The first character shall be a D, S, P, M, or R, which represents Shop/Working Drawing and other Product Data (D), Sample (S), Preliminary Submittal (P), Operating/Maintenance Manual (M), or Request for Information (R).
 2. The next five digits shall be the applicable Specification Section Number.
 3. The next three digits shall be the number 001-999 to sequentially number each initial separate item or drawing submitted under each specific Section number.
 4. The last character shall be a letter, A-Z, indicating the submission, or resubmission of the same Drawing, i.e., "A=1st submission, B=2nd submission, C=3rd submission, etc. A typical submittal number would be as follows:

Contract No.- A992_D-03300-008-B

D	=	Shop Drawing
03300	=	Specification Section for Concrete
008	=	The eighth initial submittal under this specification section.
B	=	The second submission (first resubmission) of that particular shop drawing.

- D. Notify the Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.
- E. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from his/her responsibility with regard to the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility therefor.
- F. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

G. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

1.04 Submission Requirements:

- A. The PVSC or its designated representative will be establishing a project specific folder structure for this project. The contractor shall utilize the predefined folder structure by placing all project related documents within PMWeb and its designated location.
- B. All documents will remain in their native form (xls, word, dwg, etc) and uploaded to PMWeb. If needed, system allows for check-in/check-out tasks and maintaining revisions.
- C. The Contractor shall scan all documents, in PDF format, that are in hard copy form. These scanned document files shall be uploaded and maintained in the PMWeb Document Management System for this project and linked to the corresponding record in PMWeb.
- D. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the work or in the work of any other contractor.
- E. Each submittal, appropriately coded, will be returned within **21 working days** following receipt of submittal by the Engineer.
- F. Number of final approved hard copy submittals required:
 - 1. Shop Drawings as defined in Paragraph 1.02 A: Three (3) hard copies.
 - 2. Product Data as defined in Paragraph 1.02 B: Three (3) hard copies.
 - 3. Samples: Submit the number stated in the respective Specifications Sections.
- G. Submittals shall conform:
 - 1. The date of submission and the dates of any previous submissions.
 - 2. The project title and number.
 - 3. Contractor identification.
 - 4. The name of:
 - a. Contractor
 - b. Supplier

c. Manufacturer

5. Identification of the product, with the specification section number, page and paragraph(s).
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Distinct identification of any deviations from Contract Documents.
10. Identification of revisions or resubmittals.
11. An 8" x 3" blank space for Contractor and Engineer stamps.

H. All markings to identify model number, part number, dimension, capacity, etc., shall be reproducible. Highlight markings are unacceptable.

1.05 Review of Shop Drawings, Product Data, Working Drawings and Samples:

- A. The review of shop drawings, data, and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed.
 1. As permitting any departure from the contract requirements;
 2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials.
 3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.
- B. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
- C. If the shop drawings, data or samples as submitted describe variations and show a departure from the contract requirements which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or time for performance, the Engineer may return the revised drawings without noting an exception.

D. Submittals will be returned to the Contractor under one of the following codes:

- Code 1 - "APPROVED" is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.
- Code 2 - "APPROVED AS NOTED" This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
- Code 3 - "APPROVED AS NOTED/CONFIRM" This combination of codes is assigned when a confirmation of the notations and comments is required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the confirmation.
- Code 4 - "APPROVED AS NOTED/RESUBMIT" This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the Engineer within fifteen (15) calendar days of the date of the Engineer's transmittal requiring the resubmittal.
- Code 5 - "NOT APPROVED" is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the Contract Documents.
- Code 6 - "COMMENTS ATTACHED" is assigned where there are comments attached to the returned submittal which provide additional data to aid

the Contractor.

Codes 1 through 5 designate the status of the reviewed submittal with Code 6 showing there has been an attachment of additional data.

- E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing on the letter of transmittal and on resubmitted shop drawings by use of revision triangles or other similar methods, to revisions other than the corrections requested by the Engineer, on previous submissions. Any such revisions which are not clearly identified shall be made at the risk of the Contractor. The Contractor shall make corrections to any work done because of this type revision that is not in accordance to the Contract Documents as may be required by the Engineer.
- F. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor, and will be considered "Not Approved" until resubmitted. The Engineer may at his/her option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.
- G. Repetitive Review
 - 1. Shop drawings and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the Engineer and at the Contractor's expense, based on the Engineer's then prevailing rates. The Contractor shall reimburse the Owner for all such fees invoiced to the Owner by the Engineer. Submittals are required until approved.
 - 2. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time.
- H. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least seven working days prior to release for manufacture.
- I. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

1.06 Distribution:

- A. Distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed six.

1.07 Mock-Ups:

- A. Mock-up units as specified in individual Sections, include but are not necessarily limited to, complete units of the standard of acceptance for that type of work to be used on the project. Remove at the completion of the work or when directed.

1.08 Maintenance and Lubrication Schedule/Survey

For all items of equipment furnished, the Contractor shall provide a list including the equipment name, and address and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained. In addition, a maintenance and lubrication schedule for each piece of equipment shall be submitted with the shop drawings. Final approved submission shall be three (3) hard copies. The schedules shall be in the form indicated below:

<u>Typical Maintenance Schedule</u>			
<u>Item</u>	<u>Action</u>	<u>Frequency</u>	<u>Remarks</u>
Motors	Check cleanliness	As required	Motor exterior to be kept clean. Keep air intake openings free of foreign material and do not block air outlet.
	Removal of accumulated moisture	As required	Remove plug in motor frame to drain moisture.
	Check insulation resistance	Annually	See manufacturer operation and maintenance manual for method.

<u>Typical Lubrication Schedule</u>			
<u>Item</u>	<u>Action</u>	<u>Frequency</u>	<u>Remarks</u>
Motor	6 Months	Grease lubricant, Gulf-crown Grease #2 for operating temperatures from 15 ^o F to 300 ^o F	Add grease to inlet, replace inlet plugs, run motor for ½ hour, before replacing drain plug.
Bearings			

* See manufacturer's instructional manual for initial operation instructions (important).

The Contractor shall furnish lubricants for all equipment supplied under this Contract in one delivery consisting of a minimum number of products, reflecting the results of the lubrication survey, as hereinafter specified.

1.09 Certified Shop Test Reports

Certified shop test data, for equipment not requiring witness shop tests, shall be furnished by the Contractor in accordance with the requirements of the General Conditions. Where witness shop tests are required, the Contractor shall give written notice of the tests and furnish witness shop test reports in accordance with the requirements of the General Conditions. No equipment or material shall be shipped to the Project until the Engineer notifies the Contractor, in writing, that the shop test data or reports are acceptable.

1.10 Manufacturers Certification Form

The Contractor shall submit a certificate, in the form attached to this section, from each equipment manufacturer, certifying that the equipment as installed and tested meets all the requirements of the Contract Documents that it is fully suitable and will function properly for the use intended and within the system called for by the Contract Documents, and that the guarantees as required by this Contract will be in full force and effect.

When the specifications call for "supervision, installation, adjustment, start-up," and words of similar intent, by the manufacturer's factory employed technicians or manufacturer's representatives, the Contractor shall provide a certificate co-signed by the manufacturer as to compliance with the stipulated requirements.

The final acceptance of any equipment will be withheld, appropriate amount of money will be retained by the Owner, and the warranty will not commence until such certifications are supplied.

1.11 Professional Engineer (P.E.) Certification Form:

A. If specifically required in other Sections of these Specifications, the Contractor shall submit a P.E. Certification for each item required, in the form attached to this Section, completed filled in and stamped.

1.12 General Procedures for Submittals:

A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work sections, of the Specifications, so that the installation will not be delayed by processing times including disapproval and resubmittal (if

required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the work.

1.13 American Iron and Steel Requirements and Procedures for Submittals:

The Contractor shall submit a certificate (on company letterhead), in the sample form attached to this section, for each of the covered iron and steel products noted herein, certifying that the equipment meets with the Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014.

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Federal Fiscal Year 2014.

A. Covered Iron and Steel Products - For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

- a. Lined or unlined pipes or fittings;
- b. Manhole Covers;
- c. Municipal Castings (defined in more detail by the Act);
- d. Hydrants;
- e. Tanks;
- f. Flanges;
- g. Pipe clamps and restraints;
- h. Valves;
- i. Structural steel (defined in more detail below);
- j. Reinforced precast concrete; and
- k. Construction materials (defined in more detail by the Act).

P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a Professional Engineer registered in the State of New Jersey and that he/she has been employed by (Name of Contractor) _____

_____ to design _____

_____ in accordance with Specification Section _____ for

Contract No. A992, Waste Activated Sludge Pumping Station Expansion. The

(Contract Title)

undersigned further certifies that he/she has performed the design of the _____, that said design is in conformance with all applicable local, state and federal codes, rules and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the Passaic Valley Sewage Commissioners or their representative with seven days following written request therefore by the Owner.

P.E. Name

Signature

Address

Contractor's Name

Signature

Title

EQUIPMENT MANUFACTURER'S CERTIFICATION

Owner: Passaic Valley Sewerage Commission

Project: Waste Activated Sludge Pumping Station Expansion
(PROJECT TITLE)

Contract No.: A992

EQUIPMENT SPECIFICATION SECTION: _____

EQUIPMENT DESCRIPTION: _____

I _____, authorized representative of
(Print Name)

(Print Manufacturer's Name)

hereby CERTIFY that

(Print Equipment Name & Model with Serial Number))

has been installed in complete accordance with the contract documents and manufacturers instructions and is satisfactory to _____ . The
(Manufacturer)

equipment as installed has been fully tested, operates in accordance with the contract and manufacturer's specifications, is suitable for its intended use, and is ready for permanent use by the Owner.

CERTIFIED BY: _____
(Signature of Manufacturer) (Date)

(Print Name and Title)

AMERICAN IRON AND STEEL CERTIFICATION (SAMPLE NO. 01)

The following information is provided as a sample letter of step certification for AIS compliance.

Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Step Certification for Project (A992 – Waste Activated Sludge Pumping Station Expansion)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

AMERICAN IRON AND STEEL CERTIFICATION (SAMPLE NO. 02)

The following information is provided as a sample letter of certification for AIS compliance.

Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Certification for Project (A992 – Waste Activated Sludge Pumping Station Expansion)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

*** END OF SECTION ***

SECTION 01311

CONSTRUCTION SCHEDULE

PART 1: GENERAL

1.01 PROGRAM DESCRIPTION

- A. A Critical Path Method (CPM) construction schedule shall be used to control the work of this Contract and to provide a definitive basis for determining job progress. The construction schedule shall be prepared by the Contractor. Updating will be performed by the Contractor with input from the Engineer. All work shall be done in accordance with the established CPM schedule and the Contractor and his/her subcontractors shall be responsible for cooperating fully with the Engineer and the Owner in effectively utilizing the CPM schedule.
- B. The CPM schedule to be prepared and submitted by the Contractor shall consist of a CPM network (diagram of activities) and a computer-generated schedule (print-out) using Microsoft Project®, Primavera Project Planner® or Engineer approved equal as specified herein. The format shall be the activity-on-node precedence network as indicated on the Preliminary Guideline CPM Schedule.

1.02 QUALIFICATIONS

- A. Have the capability of preparing and utilizing the specified CPM scheduling technique. A statement of CPM capability shall be submitted in writing to the Engineer within 15 days after the award of the Contract and will verify that either the Contractor's organization has in-house capability qualified to use the technique or that the Contractor employs a consultant who is so qualified. Capability shall be verified by description of the construction projects to which the Contractor or his/her consultant has successfully applied the CPM scheduling technique and which were controlled throughout the duration of the project by means of systematic use and updating of a computer-based CPM schedule. The submittal shall include the name of the individual on the Contractor's staff who will be responsible for the CPM schedule and for providing the required updating information.

1.03 NETWORK REQUIREMENTS

- A. The network shall show the order and inter-dependence of activities and the sequence in which the work is to be accomplished as planned by the Contractor. The basic concept of a network analysis diagram shall be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities.
- B. Detailed network activities shall include: construction activities, major submittals, milestones or deliverables. Break the work into activities with durations no longer than 20 working days each, except as to non-construction activities (such as procurement of significant materials or equipment and delivery of equipment) and any other activities for which the Engineer may approve the showing of longer duration. To the extent feasible, activities related to a specific physical area of the work shall be grouped on the network for ease of understanding and simplification.
- C. Separate activities shall be provided for each significant identifiable function in each trade area in each facility. Activities shall be so identified that there will be no reasonable doubt as to how

much work remains on each. Specific activities which shall be included are: all subcontract work, all interface work between subcontractors and between the Contractor and subcontractors, leakage tests of structures, tanks and pipelines, electrical connections to each item of equipment, supplier and manufacturer technical assistance, mechanical connections to each item of equipment, all tests, concrete finishing, each item of site work, (including restraints on other activities) and all utilities, fuels and chemicals.

- D. Each activity on the network shall have the following:
1. A single duration (i.e., the single best estimate of time considering the scope of the work involved in the activity and the resources planned for accomplishing the activity) expressed in working days.
 2. A five character (or less) code indicative of the party (Contractor/Subcontractor) responsible for accomplishing the activity. Additional codes for phasing, site area, and schedule of values shall be identified and included on the network.
 3. A cost estimate for each activity which, when accumulated with the cost of all activities, equals the total contract cost. Estimated overhead and profit shall be prorated throughout all activities. Materials costs shall be assigned to delivery activities. Front loading of costs shall not be allowed.
 4. A brief description of the activity.
- E. The selection and number of activities shall be subject to the Engineer's approval. The detailed network must be time scaled showing work by week.
- F. To the extent that the network or any revision thereof shows anything not jointly agreed upon or fails to show anything jointly agreed upon, it shall not be deemed to meet the specification requirements. Failure to include on a network any element of work required for the performance of this Contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding the review of the network by the Engineer.
- G. Except where earlier completions are specified, CPM schedules which show completion of all work prior to the contract completion date may be approved by the Engineer but in no event shall they be acceptable as a basis for claim for delay against the Owner by the Contractor.

1.04 COMPUTER-GENERATED SCHEDULE REQUIREMENTS

- A. Each computer-generated schedule submittal from the CPM activity network shall include the following tabulations: a list of activities in numerical order, a list of activity precedences, a schedule sequenced by Early Start Date and a schedule sequenced by Total Float. Each schedule shall include the following minimum items:
1. Activity numbers
 2. Estimated duration

3. Activity description
4. Early start date (calendar dated)
5. Early finish date (calendar dated)
6. Latest allowable start date (calendar dated)
7. Latest allowable finish date (calendar dated)
8. Status (whether critical)
9. Estimated cost of the activity
10. Total float and free float
11. Physical percent complete
12. Remaining duration

B. In addition, each schedule shall be prefaced with the following summary data:

1. Contract name and number
2. Contractor's Name
3. Contract duration
4. Contract schedule
5. The effective or starting date of the schedule (the date indicated in the Notice to Proceed).

C. The work day to calendar date correlation shall be based on an 8-hour day and 40-hour week with adequate allowance for holidays, adverse weather and all other special requirements of the work.

1.05 INITIAL CONFERENCE

- A. Within 15 days following the receipt of the Notice to Proceed, meet with the Engineer to discuss and agree on the proposed standards for the CPM schedule. At this conference submit to the Engineer a preliminary network defining the planned operations during the first 60 calendar days after Notice to Proceed. The general approach for the balance of the project shall be indicated. Cost of activities expected to be completed or partially completed before submission and approval of the complete network shall be included.

1.06 APPROVED CPM SCHEDULE

- A. Within 45 days following the receipt of the Notice to Proceed, submit two prints of the proposed CPM activity network and a computer-generated schedule to the Engineer. Following a two

week review by the Engineer, the Contractor shall finalize the network and submit five prints and two reproducible of the revised network and two copies of the computer-generated schedule. This final submittal shall be delivered to the Engineer within 65 days after the Notice to Proceed. Once this final submittal is deemed in accordance with the specifications by the Engineer, the CPM schedule shall be used for planning, organizing and directing the work, and reporting progress.

- B. CPM schedules which contain activities showing negative float or which extend beyond the contract completion date in the computer- generated schedule will not be approved.
- C. Review of the CPM activity network by the Engineer is advisory only and shall not relieve the Contractor of responsibility for accomplishing the work within the contract completion date. Omissions and errors in the approved CPM schedule shall not excuse performance less than that required by the Contract. Review by the Engineer in no way makes the Engineer an insurer of the CPM schedule's success or liable for time or cost overruns flowing from its shortcomings. The Owner hereby disclaims any obligation or liability by reason of review by its agent, the Engineer, of the CPM schedule.
- E. The CPM activity network shall be submitted on sheets 24-in by 36-in and may be divided into as many separate sheets as required.

1.07 PROGRESS REPORTING

- A. Progress under the approved CPM schedule shall be evaluated monthly by the Contractor and the Engineer. Not less than 7 days prior to each monthly progress meeting, they shall meet at the jobsite and jointly evaluate the status of each activity on which work has started or is due to start, based on the preceding CPM schedule; to show actual progress, to identify those activities started and those completed during the previous period, to show the estimated time required to complete or the physical percent complete of each activity started but not yet completed and to reflect any changes indicated for the network. Activities shall not be considered to be complete until they are, in fact, 100 percent complete.
- B. Within two weeks following each monthly progress meeting, submit a narrative report based on the CPM schedule evaluation described above, in a format agreed upon by the Contractor and the Engineer. The report shall include a description of the progress during the previous period in terms of completed activities, an explanation of each activity which is showing a delay, a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates and an explanation of corrective action taken or proposed. The Contractor shall include costs to date for the period during which the meeting takes place. This report, as well as the CPM Status Report, will be discussed at each progress meeting.
- C. Provide an updated schedule based on the results of the monthly progress meeting.

1.08 RESPONSIBILITY FOR SCHEDULE COMPLIANCE

- A. Whenever it becomes apparent from the current CPM schedule and CPM Status Report that delays to the critical path have resulted and the contract completion date will not be met, or when

so directed by the Engineer, take some or all of the following actions at no additional cost to the Owner. Submit to the Engineer, a written statement of the steps intended to take to remove or arrest the delay to the critical path in the approved schedule.

1. Increase construction manpower in such quantities and crafts as will substantially eliminate the backlog of work.
 2. Increase the number of working hours per shift, shifts per day, working days per week, the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate the backlog of work.
 3. Reschedule activities to achieve maximum practical concurrence of accomplishment of activities and comply with the revised schedule.
- B. If when so requested by the Engineer, failure to submit a written statement of the steps intended to take or should fail to take such steps, the Engineer may direct the Contractor to increase the level of effort in man-power (trades), equipment and work schedule (overtime, weekend and holiday work, etc) to be employed by the Contractor in order to remove or arrest the delay to the critical path in the approved schedule and the Contractor shall promptly provide such level of effort at no additional cost to the Owner.

1.09 ADJUSTMENT OF CONTRACT SCHEDULE AND COMPLETION TIME

- A. If the Contractor desires to make changes in his/her method of operating which affect the approved CPM schedule, he/she shall notify the Engineer in writing stating what changes are proposed and the reason for the change. If the Engineer reviews these changes, the Contractor shall revise and submit, without additional cost to the Owner, all of the affected portions of the CPM network. The CPM schedule shall be adjusted by the Contractor only after prior review of his/her proposed changes by the Engineer. Adjustments may consist of changing portions of the activity sequence, activity durations, division of approved activities, or other adjustments as may be approved by the Engineer. The addition of extraneous, non-working activities and activities which add unapproved restraints to the CPM schedule shall not be allowed.
- B. If the completion of any activity, whether or not critical, falls more than 100 percent behind its duration, submit for review a schedule adjustment showing each such activity divided into two activities reflecting completed versus uncompleted work.
- C. The contract completion time will be adjusted only for causes specified in this Contract. In the event the Contractor requests an extension of any contract completion date, he/she shall furnish such justification and supporting evidence as the Engineer may deem necessary to determine whether the Contractor is entitled to an extension of time under the provisions of this Contract. The Engineer will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing thereof. If the Engineer finds that the Contractor is entitled to any extension of any contract completion date, the Engineer's determination as to the total number of days extension shall be based upon the currently accepted CPM schedule and on all data relevant to the extension. Such data shall be included in the next updating of the schedule. Actual delays in activities which, according to the CPM schedule, do not affect any

contract completion date shown by the critical path in the network will not be the basis for a change therein.

- D. Each request for change in any contract completion date shall be submitted by the Contractor to the Engineer within 30 days after the beginning of the delay for which a time extension is requested but before the date of final payment under this Contract. No time extension will be granted for requests which are not submitted within the foregoing time limit.
 - 1. From time to time it may be necessary for the contract schedule or completion time to be adjusted by the Owner to reflect the effects of job conditions, weather, technical difficulties, strikes, unavoidable delays on the part of the Owner or its representatives and other unforeseeable conditions which may indicate schedule adjustments or completion time extensions. Under such conditions, the Engineer will direct the Contractor to reschedule the work or contract completion time to reflect the changed conditions and the Contractor shall revise his/her schedule accordingly. No additional compensation will be made to the Contractor for such schedule changes except for unavoidable overall contract time extensions beyond the actual completion of all unaffected work, in which case the Contractor shall take all possible action to minimize any time extension and any additional cost to the Owner. Available float time in the CPM schedule may be used by the Owner as defined by the Engineer, as well as by the Contractor.
- E. The Owner controls the float time in the approved CPM network and, therefore, without obligation to extend either the overall completion date or any intermediate completion dates set out in the CPM network, the Owner may initiate changes to the work that absorb float time only. Owner initiated changes that affect the critical path on the approved CPM network shall be the sole grounds for extending (or contracting) said completion dates. Contractor-initiated changes that encroach on the float time identified in the approved CPM network may be accomplished with the Owner's concurrence. Such changes, however, shall give way to Owner-initiated changes competing for the same float time.

1.10 COORDINATING SCHEDULES WITH OTHER CONTRACT SCHEDULES

- A. Where work is to be performed under this Contract concurrently with or contingent upon work performed on the same facilities or area under other contracts, the Contractor's CPM Schedule shall be coordinated with the schedules of the other contracts. Obtain the schedules of the other appropriate contracts from the Owner for the preparation and updating of the CPM schedule and make the required changes in the schedule when indicated by changes in corresponding schedules.
- B. In case of interference between the operations of different contractors, the Owner will determine the work priority of each contractor and the sequence of work necessary to expedite the completion of the entire project. In all such cases, the decision of the Owner shall be accepted as final. The temporary delay of the Contractor's work due to such circumstances shall not be considered as justification for claims for additional compensation.

END OF SECTION

SECTION 01325

CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.01 CONSTRUCTION PHOTOGRAPHS

A. The Contractor shall engage the services of an experienced photographer, approved by the Engineer, to take job photographs. The photographer will be required to take preliminary photographs of the site prior to the commencement of work as directed by the Engineer. Subsequent photographs as determined by the Engineer shall be taken during the construction phase. The lump sum price bid shall be based on the following:

1. Take a minimum of twenty (20) 8-inch by 10-inch color glossy print photos of the site prior to commencement of work and a minimum of twenty (20) 8-inch by 10-inch color glossy print photos of the site at the completion of work. Take a minimum of twenty (20) 8-inch by 10-inch color glossy print photos every month. For the purpose of this section, a photograph shall be defined as one exposure. The Engineer shall reserve the right to reject any photograph that is not clear or definitive. Any photograph so rejected shall be subtracted from the total number of exposures before computations for payment or credit under this section. Contractor shall supply three (3) sets of prints for each exposure, each set contained in a hard backed three ring binder. The prints shall have indelibly printed on their reverse side the following:

- Project Name
- Photo Number
- View and description, indicating location of camera, general description of what photograph represents and whether this is a preliminary or construction photograph.

The Contractor shall also furnish the raw images on CD in .jpeg format, CDs shall be provided for each photo session submittal. No separate payment will be made for job photographs; payment shall be included in the lump sum bid.

2. Photographs shall be submitted with each progress payment. Payments may be held until photographs are submitted.

END OF SECTION

SECTION 01330

OPERATION AND MAINTENANCE MANUALS

PART 1 – GENERAL

1.01 Description of Requirements

This section specifies the general methods and requirements of submissions applicable to Operation and Maintenance Manuals. Operation and Maintenance Manuals shall be provided for all equipment and process systems supplied under this Contract. The Contractor shall submit a list of all Operation and Maintenance Manuals to be supplied for the Engineer's review and approval. Additional general submission requirements are contained in Section 01300 – Submittals and individual technical specification sections.

1.02 Operation and Maintenance Manuals

A. Operation and maintenance manuals include, but are not necessarily limited to, a separate document for each piece of equipment and process system which cover only the specific equipment or process installed with the following specific requirements:

a. Contents:

Title page

Copy of complete specifications for equipment installed, including model, serial number and all other nameplate data.

Brief description of each system (process, mechanical, electrical, etc.) components and flow diagrams.

Exploded views of equipment.

Pre startup procedures.

Starting and stopping procedures (both normal and emergency).

Special operating instructions, including abnormal operating conditions and procedures to return to normal operating conditions.

Routine maintenance procedures and trouble shooting procedures.

Routine and special lubrication procedures and instructions, and a list of all required lubricants by commercial name.

Safety considerations.

Emergency procedures.

Description of potential leak or discharge conditions, including control and mitigation procedures.

Description of leak monitoring and containment equipment.

Inspection procedures.

Operational logs and checklists.

Manufacturer's printed operating and maintenance instructions, parts lists, illustrations, and diagrams.

Instrumentation drawings per ISA-S5.4, Schematics per JIC, EGP and EI, latest revisions.

One (1) hard copy each of wiring diagram.

Electric motor data including bearing data.

One (1) final approved hard copy of each shop drawing and each Contractor's coordination and layout drawing.

List of recommended spare parts, manufacturer's price, and recommended quantity.

List of all required special tools (or statement that none are required).

All markings on catalog cuts, drawings, etc., shall be reproducible. "Highlighter" markings are not acceptable.

Name, address and telephone numbers of local service representatives.

b. Material:

Loose leaf punched paper.

Page size, 8-1/2" by 11".

Diagrams and illustrations, attached foldouts as required of original quality, reproducible by dry copy method.

Drafting shall be in accordance with current ANSI Drafting Manual.

Covers: oil, moisture and wear resistant 9" x 12" size.

c. Submittals to the Engineer:

1. Three (3) preliminary hard copies of manuals shall be submitted with form attached to this section. The Contractor is to provide information and initial each item on check list. The Engineer will initial form as part of the review. Manuals not accompanied by this form will be returned without being reviewed. These preliminary copies must be submitted no later than **fifteen (15) days** following approval of the shop drawings for each piece of equipment or system and three (3) final approved hard copies of complete manuals prior to Engineer's tests and acceptance for beneficial use.
2. Not more than forty percent (40%) of the cost of the equipment, installed in place, (based on the Contractor's lump sum breakdown) will be paid until the preliminary copies of the operation and maintenance manuals have been approved by the Engineer.
3. Each manufacturer's operation and maintenance manual(s) shall have printed on the cover of the manual A992 – Waste Activated Sludge Pumping Station Expansion, Operation and Maintenance Manual, Product/Process System Identification, the specification section with item number and specific equipment's plant location.
4. Where existing systems or equipment are being modified, Contractor shall furnish such information needed to fully update and revise the existing manufacturer's manuals. The information shall be in such form as to be easily inserted in the existing manufacturer's manuals. Where electrical or control modifications are being made, Contractor shall furnish as-built electrical power, control, and ladder diagram drawings for all work performed.

PASSAIC VALLEY SEWERAGE COMMISSION
CONTRACT NO. A992
WASTE ACTIVATED SLUDGE PUMPING STATION EXPANSION
(Contract Title)
OPERATION AND MAINTENANCE MANUAL - MINIMUM CHECK LIST

Submittal No. _____

	Cont	Eng.
Three (3) preliminary and three (3) final approved complete sets of operation and maintenance instructions	<input type="checkbox"/>	<input type="checkbox"/>

The manuals for each piece of equipment and process system shall be a separate document and cover only the specific equipment or process system installed with the following specific requirements:

Contents:

Title Page	<input type="checkbox"/>	<input type="checkbox"/>
Copy of complete specifications for equipment installed, including model, serial number and all other nameplate data.	<input type="checkbox"/>	<input type="checkbox"/>
Brief description of each system (process, mechanical, electrical, etc.), components and flow diagrams.	<input type="checkbox"/>	<input type="checkbox"/>
Exploded views of equipment	<input type="checkbox"/>	<input type="checkbox"/>
Pre startup procedures	<input type="checkbox"/>	<input type="checkbox"/>
Starting and stopping procedures (both normal and emergency).	<input type="checkbox"/>	<input type="checkbox"/>
Special operation instructions, including abnormal operating conditions and purchases to return to normal operating conditions.	<input type="checkbox"/>	<input type="checkbox"/>
Routine maintenance procedures and trouble shooting procedures.	<input type="checkbox"/>	<input type="checkbox"/>
Routine and special lubrication procedures and instructions, and a list of all required lubricants by commercial name.	<input type="checkbox"/>	<input type="checkbox"/>
Safety considerations.	<input type="checkbox"/>	<input type="checkbox"/>
Emergency procedures.	<input type="checkbox"/>	<input type="checkbox"/>
Description of potential leak or discharge conditions, including control and mitigation procedures.	<input type="checkbox"/>	<input type="checkbox"/>
Description of leak monitoring and containment equipment.	<input type="checkbox"/>	<input type="checkbox"/>

	Cont.	Eng.
Inspection procedures.	<input type="checkbox"/>	<input type="checkbox"/>
Operational logs and checklists.	<input type="checkbox"/>	<input type="checkbox"/>
Manufacturer's printed operating and maintenance instructions, parts lists, illustrations, and diagrams.	<input type="checkbox"/>	<input type="checkbox"/>
Instrumentation drawings per ISA-S5.4, Schematics per JIC, EGP and EI, latest revisions.	<input type="checkbox"/>	<input type="checkbox"/>
One copy of each wiring diagram.	<input type="checkbox"/>	<input type="checkbox"/>
Electric motor data including bearing data.	<input type="checkbox"/>	<input type="checkbox"/>
One (1) approved hard copy of each shop drawing and each Contractor's coordination and layout drawing.	<input type="checkbox"/>	<input type="checkbox"/>
List of recommended spare parts, manufacturer's price, and recommended quantity.	<input type="checkbox"/>	<input type="checkbox"/>
List of all required special tools (or statement that none are required).	<input type="checkbox"/>	<input type="checkbox"/>
All markings on catalog cuts, drawings, etc., shall be reproducible. "Highlighter" markings are not acceptable.	<input type="checkbox"/>	<input type="checkbox"/>
Name, address and telephone numbers of local service representatives.	<input type="checkbox"/>	<input type="checkbox"/>

Material:

Loose leaf punch paper.	<input type="checkbox"/>	<input type="checkbox"/>
Page size, 8-1/2" by 11".	<input type="checkbox"/>	<input type="checkbox"/>
Diagrams and illustrations, attached fold outs as required for original quality, reproducible by dry copy method.	<input type="checkbox"/>	<input type="checkbox"/>
Drafting shall be in accordance with current ANSI Drafting Manual.	<input type="checkbox"/>	<input type="checkbox"/>
Covers: oil, moisture and wear resistant 9" x 12" size.	<input type="checkbox"/>	<input type="checkbox"/>

Each manufacturer's Operating and Maintenance Manual(s) shall have printed on the cover of the manual Contract No. _____ - _____
(Contract Title)
_____, "Operation and Maintenance Manual",
Product/Process System Identification, the specification section with item number and specific equipment's plant location.

*** END OF SECTION ***

SECTION 01340

IDENTIFICATION

PART 1 – GENERAL

1.01 Scope of Work

1. The Contractor shall furnish and install all components of the system for identification of piping, ducts, conduits, panels, disconnect switches, junction boxes, and equipment as specified hereinafter. A master equipment list shall be furnished along with drawings indicating location and Owners 15-digit asset I.D. numbers for equipment, valves and appurtenances. The system shall include the placing of acrylic plastic identification signs and direction-of-flow arrows on all visible plant piping, the placing of brass valve identification tags, and the fastening of engraved plastic nameplates on plant equipment. In addition, each pressure and temperature gauge shall be furnished with identifying tags noting the gauge operational range. The Contractor shall paint the equipment and piping in the colors herein specified and in accordance with the requirements of Division 9 – Painting. The Contractor shall furnish and install underground pipeline markers for all buried piping installed as part of their contract. The underground pipeline markers shall be installed such that a continuous pipeline demarcation is formed. Additional and supplemental requirements are specified in Divisions 13, 15 and 16.
2. All submissions under this section shall be in accordance with the requirements of Section 01300- Submittals.

1.02 Identification Signs

A. General

Lettering shall be carefully made in capital block letters so as to produce a clear, legible sign. No lettering, symbol or markings containing the name of the manufacturer will be permitted to be placed on the signs. Fabrication of signs and nameplates shall be performed in a sound workmanlike manner. Samples of the lettering to be used for Pipe Identification Signs, and Equipment Nameplates shall be

submitted to the Engineer for approval before manufacturing begins. Such samples shall show the height, width and spacing of letters and numbers for any three (3) legends of ten or more letters and spaces as listed herein.

B. Pipe Identification Signs

1. Pipe identification signs shall be fabricated of acrylic plastic suitable for outdoor installation. Signs shall be resistant to corrosive chemicals or color fading from exposure to heat or sunlight.
2. Pipe identification signs shall conform to the requirements of ANSI A13.1-1981 for overall size, lettering size and length of color field. Legends and colors shall be as specified. All signs shall incorporate direction of flow arrows and pipe sizes (i.e. 6-inch). The service abbreviation shall be shown on the signs.
3. Pipe identification signs shall be "Setmark" pipe markers as manufactured by Seton Nameplate Corp., or equal.
4. All underground pipeline markers shall consist of 6" wide brightly colored tape consisting of 4 mil thick plastic, vinyl, or other non-biodegradable material and shall be resistant to chemical attack. Underground pipeline markers shall be Carlton SMART TAPE, or equal.
5. Underground pipeline markers shall also have the words "CAUTION" and "Buried Pipeline Below" added. Markers shall be installed face-up in two (2) continuous layers over the pipeline they are intended to mark. The first layer shall be installed three to six inches directly over the top of the piping. The second layer shall be installed 24-30 inches directly over the top of the piping. In no case shall the underground pipeline marker interfere with the installation of other pipelines, structures, roadways, valves, valve boxes, hydrants, etc.
6. Pipeline signs, and finish coats of paint for pipelines and equipment shall be coded as in the attached Schedule 01340-1. All pipelines and equipment shall be painted in conformity with the requirements of Division 9 – Painting. The

color of the final coats of paint shall be color coded. Where aluminum or stainless steel is specified for pipe, duct work or insulated jackets the exterior shall not be painted. Pipes flanges, flexible couplings, valves and fittings for such jacketed lines shall be painted with the foregoing color code. Vents and drains shall be in the same color combination as the contents of tanks and equipment vented and drained.

7. Identification signs for piping shall be located along straight line runs at intervals not to exceed 30 feet and near valves, branches and junction points and where pipes pass through walls or ceilings. Direction-of-flow arrows shall be located at intervals not to exceed 15 feet and near valves, branches, junction points and changes in direction or where required for clarity. All piping identification signs shall be placed so as to be easily visible from operating locations.
8. Identification signs and arrows on piping shall be mounted parallel and tangent to the pipe and valves by fastening with screws, plastic or fiber washers, threaded brackets and banding straps and seals. Screws and brackets shall be stainless steel with 5/16 – 18 American Standard Coarse Threads; bands shall be 25 gage stainless steel, 3/4 inch wide spring type retainers or straps shall not be permitted. All attachment and bolting devices shall be of type 304 stainless steel. Where pipe is insulated, the Contractor shall use care in mounting the signs so as to prevent the banding straps from crushing the insulation.

The mounting assembly shall be Steelbinder No. 0011-SS-4 strapping unit as manufactured by A.J. Gerrard & Co., Melrose Park, Ill.; Independent Metal Strap Co., Inc., Roslyn, N.Y., or equal.

C. Equipment, Valves and Appurtenance Identification

The Contractor shall be responsible for furnishing and installing tags and nameplates for all equipment, valves and appurtenances required on this project. Tags and

nameplates shall have on them the information specified herein as part of the Owners fifteen (15) digit asset I.D. numbering system. The fifteen (15) digit asset I.D. number differs from the number on the contract drawing. The Contractor shall furnish a Master Equipment List (MEL) which indicates the following information:

15-digit asset I.D. Number

Functional description or process identification

Location of Installation

Service

Size / Capacity / Type

Drawing I.D. Number

Manufacturers Name

Model Number (if applicable)

Serial Number (if applicable)

Vendor / Supplier name and address

Vendor / Supplier phone and fax numbers

The MEL shall be developed in a Microsoft Excel or Access spreadsheet and submitted preliminarily (three [3] hard copies and electronic format) for review and approval by the Engineer and Owner.

Upon completion of equipment installation the Contractor and Engineer shall jointly review the MEL in the field before asset I.D. numbers are provided by the Owner. The Contractor shall make the necessary changes and submit a final approved MEL (three [3] hard copies and electronic format) for review and approval by the Engineer and the Owner.

The Owner will issue to the Engineer all the asset I.D. numbering for the project, which the Contractor shall use to print the valve tags, equipment nameplates and appurtenance identification as specified herein.

1. Valve Identification Tags

Valve tags shall be non-corrosive brass, 2" in diameter, minimum 19 gauge thick with a 1/8" diameter punched hole. The 1/8" diameter hole shall be filled with a stainless steel grommet for attachment to the valve with a stainless steel chain or strapping. Valve tags shall carry one (1) line of engraving which

contains the owners fifteen (15) digit asset number. Engraving shall be centered on the tag. Valve tags shall be located on or adjacent to the valves bonnet or flange bolts. Attachment of tags to handwheel of valve will not be permitted. All underground valves shall carry three (3) lines of engraving which contains the name of service, valve size and the fifteen (15) digit asset I.D. number. Underground valve tags shall be secured by approved (grouted) methods to concrete encasement or floor by the valve box.

2. Equipment Nameplates

Nameplates for equipment shall be engraved plastic nameplates made from 1/16-inch thick laminated non-flammable phenolic engraving stock, black surface over white letters. Lettering shall be 3/4-inch high standard block lettering "Helvetica" style. Engraving through the durable black surface color, exposing the contrasting white core color shall produce permanent lettering. Nameplates shall carry two (2) lines of engraving. The equipment's name shall be centered on the top line of lettering and its fifteen (15) digit asset I.D. number shall be centered below the name. Equipment names are as shown on the Contract Drawings. Nameplates shall be secured with stainless steel rivets or screws, not to cause damage to the equipment. Nameplates shall be located on equipment bases and on structures at readily visible levels in such positions relative to the equipment and structures as to prevent damage to the nameplate.

3. Drawings

The Contractor shall be responsible for furnishing three (3) preliminary sets of plans, which indicate location with asset I.D. numbers for all valves, equipment and appurtenances required on the project, for review and approval by the Engineer. After final approval furnish three (3) sets of plans indicating location with asset I.D. numbers. In addition provide one (1) electronic format (AutoCAD Rel. 14 or greater) and one(1) Mylar reproducible drawing for the Owner.

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNE MEC Color No.	Remarks
1	Bldg. Roof Leaders	BRL	Mist Gray		F-39	
2	Bldg. Storm Drain	BSD			2052	
3	Bldg. Sanitary and	BSA	No. 61 Gray	6" White @ 30" O.C.	F-34	
4	Bldg. Floor Drainage	BFD			2053	
5	Chlorine Gas	GCL	Bright Yellow	2" Orange @ 24" O.C.	Y-111 2026	
6	Chlorine Liquid	LCL	Bright Yellow	2" Red @ 30" O.C.	Y-111 2026	
7	Chlorine Solution	CLS	Bright Yellow	2" Gray @ 30" O.C.	Y-111 2026	
8	Chlorine Solution Diffuser	CLD	Bright Yellow	2" Gray @ 30" O.C.	Y-111 2026	All pipes except RL & RC pipe appurtenances
9	Chlorinator Water (NPW)	CW	Light Gray	6" Red @ 30" O.C.	F-42 2050	
10	Combustion Air	CA	Powder Blue	3" Red @ 72" O.C.	B-121 2040	
11	City Water	W	Safety Blue		B-5 2045	
12	Conduit Drains	CD	Safety Blue	2" Black @ 30" O.C.	B-5 2045	
13	Cooling Water	CW	Azure	6" Green @ 72" O.C.	B-8 2044	

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNEMEC Color No.	Remarks
14	Cooling Water Supply	CWS	Azure	6" White @ 72" O.C.	B-8 2044	
15	Cooling Water Return	CWR	Azure	6" Red @ 72" O.C.	B-8 2044	
16	Dewatering	DW	*	6" Green @ 72" O.C.		Note 2
17	Dilution Water	DL; DLW	Azure		B-8 2044	All piping and appurt. from pump suction flange including pump and motor
18	Drains (Piping drains and sidewalk door drains)	DR	Mist Gray	2" Black @ 30" O.C.	F-39 2052	Steel pipe and appurt.
19	Effluent Water (Final Clar. Effl.)	EW	No. 61 Gray		F-34 2053	All piping appurt. to pump suction flange
20	Electrolyte Cooling Water Supply	ECS	Light Gray	3" Orange @ 24" O.C.	F-42 2050	Note 2
21	Electrolyte Cooling Water Return	ECR	Light Gray	3" Orange @ 24" O.C.	F-42 2050	
22	Final Clarifier Influent	FCI	Mist Gray	2" White @ 30" O.C.	F-39 2052	Note 2
23	Fire Stand Piping	FSP	Safety Red		R-9 2008	
24	Fuel Oil Supply	FOS	Black	6" White @ 30" O.C.	J-5 2009	

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNE MEC Color No.	Remarks
25	Fuel Oil Return	FOR	Black	6" Red @ 30" O.C.	J-5 2009	
26	Heat Treatment Plant Supernatant Return	HTPSR	International Orange		Y-3 2017	See Note 1
27	Heating Water Supply	HS	Powder Blue	2" Red @ 30" O.C.	B-121 2040	
28	Heating Water Return	HR	Powder Blue	2" Red @ 30" O.C.	B-121 2040	
29	Hot Water Domestic	HWD	Safety Blue	6" Red @ 30" O.C.	B-5 2045	
30	Influent (Sewage Screened, Degritted and Degreased)	ISP	No. 61 Gray		F-34 2053	Top bearing, gear box, motor, etc., in operating room.
31	City Gas	GAS	Safety Red	2" Yellow @ 24" O.C.	R-9 2008	Note 2
32	Lawn Sprinkling	LSP	Light Gray	2" Red @ 24" O.C.	F-42 2050	
33	Lubrication Oil	LO	Black	2" White @ 24" O.C.	J-5 2009	
34	Waste Mixed Liquor	WML	Cinnamon		D-106 2003	Name of Service Stencil
35	Mixed Liquors	ML	Cinnamon			

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNE MEC Color No.	Remarks
36	Non-Potable Water	NPW	Light Gray		F-42 2050	All piping & appurt. from pump suction flange including pump & motor
37	Non-Potable Water By-Pass	NPW-BYPASS	No. 61 Gray	2" Blue @ 30" O.C.	F-34 2053	
38	Non-Potable Water Hose Bibb	HB	No. 61 Gray			Paint Engine Hose Bibb
39	Oxygenation Tanks – Influent (Mixed Liquor)	OX1	Cinnamon		D-106 2003	Note 2
40	Oxygenation Mixers	OXM	Bright Yellow		Y-111 2026	Entire Equip. Package
41	Oxygen (Stainless Steel)	O	Not Painted			Stencils Only
42	Oxygen (Steel)	0	White		W-3 2000	Stencils
43	Plant Air	PLA	Powder Blue	2" White @ 24" O.C.	B-121 2040	Note 1
44	Plant Air Hose Valve	HV	Powder Blue		B-121 2040	Paint Engine Air Hose Valve
45	Plant Effluent Discharge	PED	Mist Gray	2" Black @ 30" O.C.	F-39 2052	

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNE MEC Color No.	Remarks
46	Plant Effluent Well Vents	PEWV	Outdoor Steel Protective Coat & Fin. Color			As directed by the Engineer
47	Primary Sludge	PS	Antique Brown		D-14 2006	Note 2
48	Process Air	PRA	Powder Blue		B-121 2040	
49	Reclaim Piping	RP	Safety Blue	2" Yellow @ 30" O.C.	B-5 2045	
50	Return Sludge	RS	Cypress Green		G-12 2032	Screw Pump/Outdoor motor, gear box, etc. in operating room
51	Scum	SC	Cinnamon	2" White @ 24" O.C.	D-106 2003	Note 1
52	Scum Lines	SCE	Cinnamon	2" White @ 24" O.C.	D-106 2003	Note 1
53	Seed Sludge	SSL	Cinnamon	2" Brown @ 30" O.C.	D-106 2003	8" pipe in utility tunnel from return & waste sludge p.s. to supernatant treatment plant
54	Sludge Withdrawal	SLW	Palm Green	2" Yellow @ 30" O.C.	G-33 2033	Note 2
55	Sludge Thickeners Supernatant Return	STSR	Safety Orange	6" White @ 30" O.C.	Y-15 2016	

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNE MEC Color No.	Remarks
56	Strainer Backwash	SWB	No. 61 Gray	2" Black @ 30" O.C.	F-34 2053	Note 2
57	Sump Pumps Discharge	SP	*			
58	Supernatant Treatment Plant Effluent	STPE	Safety Orange	6" White @ 72" O.C.	Y-15 2016	
59	Tanks Drains	TD	*			Note 2
60	Underground Tank Vents	UTV	Black		J-5 2009	
61	Vent (Dewatering Wells)	V	Mist Gray	2" Black @ 24" O.C.	F-39 2052	Vent post finish as approved by Engineer
62	Waste Oil	WO	Black	2-2" White @ 24" O.C.	J-5 2009	Note 1
63	Crank Case Oil	CO	Black	2" Orange @ 24" O.C.	J-5 2009	Note 1
64	Waste Sludge	WS; WSL	Palm Green	6" White @ 30" O.C.	G-33 2033	Note 1
65	Waste Sludge & Chemical Sludge	WS & CSL	Palm Green	2" White @ 24" O.C.	G-33 2033	Chemical sludge – No banding name service/stencil
66	Instrument & Purge Air	I + PA	Powder Blue	2" Brown @ 24" O.C.	B-121 2040	Name of Service stencil and Note 1
67	Instrument Air	IA	Powder Blue	2" Brown @ 24" O.C.		

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNE MEC Color No.	Remarks
68	Brine	B	Light Gray	2" Yellow @ 24" O.C.	F-42 2050	
69	Polymer Solution	PMS	Powder Blue	2" Red @ 24" O.C.	B-121 2040	Name of service stencil and Note 1
70	Polymer	P	Powder Blue	2" Red @ 24" O.C.	B-12 2040	Name of service stencil and Note 1
71	Seal Water	SW; SEW	Safety Blue	6" White @ 30" O.C.	B-5 2045	Note 1
72	Soft Water	SOW	Safety Blue	2" Green @ 24" O.C.	B-5 2045	Note 1 Service & Symbol by Stencil
73	Softened Water	SFW	Safety Blue	2" Green @ 24" O.C.		
74	Thickened Sludge	TSL	Antique Brown	6" White @ 72" O.C.	D-14 2006	Note 1
75	Grit	G	Black	2" Red @ 24" O.C.	J-5 2009	
76	Sludge Stor. Tank, Supernatant Ret.	SSR; SLS; TSR	Safety Orange	2" White @ 24" O.C.	Y-15 2016	
77	Oxidized Sludge & Vapor	OSL & V	Cinnamon	2" Yellow @ 72" O.C.	D-106 2003	
78	Oxidized Sludge	OSL	Cinnamon	2" Red @ 72" O.C.		
79	Vapor	V; VA	Safety Green	6" Brown @ 72" O.C.	G-11 2036	

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNEMEC Color No.	Remarks
80	Scrubbed Vapor	SVA	Cypress Green	2" Brown @ 24" O.C.	G-11 2032	
81	Scrubbed Water	SW	Light Gray	2" Green @ 24" O.C.	F-42 2050	
82	Propane	P	Safety Red	2" Gray @ 24" O.C.	R-9 2008	Note 1
83	Decant Sludge	DSL	International Orange	6" Black @ 72" O.C.	Y-3 2017	
84	Steam	STM	Safety Orange		Y-15 2016	
85	Lime Slurry	LS	Powder Blue	6" Yellow @ 30" O.C.	B-121 2040	Note 1
86	Thickener Influent	TI	Antique Brown	2" Yellow @ 30" O.C.	D-14 2006	Note 2
87	Propane Gas	PG	Safety Red	2" Orange @ 30" O.C.	R-9 2008	Note 1
88	Thickener Scum	TSC	Cinnamon	2" White @ 24" O.C.	D-106 2003	Note 1
89	Supernatant (Recirculating)	S	Safety Orange	2" Brown @ 24" O.C.	Y-15 2016	
90	Nitric Acid	NA	Bright Yellow	2" Brown @ 30" O.C.	Y-111 2025	Stencil Only (Nitric Acid Fill/NAF)

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNE MEC Color No.	Remarks
91	Nitric Acid	NA	Bright Yellow	2" Brown @ 30" O.C.	Y-111 2025	Stencil Only (Nitric Acid Vent/V) No Banding
92	Not Used					
93	Not Used					
94	Sludge & Air (High Pressure Sludge)	S&A SL&A	Antique Brown	6" Red @ 30" O.C.	D-14 2006	Note 1
95	Settling Tank Effluent Sludge	STE	Palm Green	2" Red @ 24" O.C.	G-33 2033	Note 2
96	Sludge	SL	Palm Green	2" Red @ 24" O.C.	G-33 2033	Note 2
97	Transformer Oil	TRO	Black	2" Green @ 30" O.C.	J-5 2009	Note 1
98	Solvent	SOV; SOL	Safety Yellow	2" Brown @ 24" O.C.	Y-15 2025	Name of Service, Stencil
99	Solvent Drain	SOL; SOL-DE	Safety Yellow	2" Brown @ 24" O.C.		
100	Solvent Return	SOL-R	Safety Yellow	2" Brown @ 24" O.C.		
101	Solvent Supply	SOL-S	Safety Yellow	2" Brown @ 24" O.C.		
102	Chemical (Sodium Sulfit)	CHEM	Purple		TNE MEC B-17	Use 2045 Tnemec + Red to match Mobil purple
103	Cooling Water (Oxygenation)	CWO	Azure	6" Green @ 72" O.C.	B-8 2044	

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNE MEC Color No.	Remarks
104	Spray Water-Foam Control	SW-FC	Azure	3" Yellow @ 24" O.C.	B-8 2044	
105	Vacuum	VA	Powder Blue	2" Gray @ 24" O.C.	B-121 2040	
106	Spray Water	SPW	Azure	6" Yellow @ 30" O.C.	B-18 2044	Note 1
107	Not Used					
108	Not Used					
109	Not Used					
110	Recirculated Spray Water (Vapor Scrubber)	RSP	Light Gray	2" Green @ 24" O.C.	F-42 2050	Note 1
111	Primary Clarifier Influent	PCI	Stoneridge		F-38 2023	Note 2
112	Primary Clarifier Dewatering	PCD	Stoneridge	6" Red @ 72" O.C.		
113	Heated Non-Potable Water	HNPW	Light Gray	6" Yellow @ 72" O.C.	F-42 2050	Note 1
114	Sludge Feed & Dewatering Sludge	SF	Cinnamon	6" Yellow @ 72" O.C.	D-106 2003	Note 1
115	Sludge Drain	SD	*			Note 2
116	Filtrate Collection	FC	(All) International Orange	(All) 6" Brown @ 72" O.C.	Y-3 2017	Name of Service Stencil

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNE MEC Color No.	Remarks
117	Filtrate	F	(All) International Orange	(All) 6" Brown @ 72" O.C.	Y-3 2017	Name of Service Stencil
118	Filtrate Discharge	FD	(All) International Orange	(All) 6" Brown @ 72" O.C.	Y-3 2017	Name of Service Stencil
119	Filtrate Vent	FV	*			Note 2
120	Core Blow	CB	Cinnamon	6" Black @ 72" O.C.	D-106 2003	
121	Compressed Air	COA	Powder Blue	2" Green @ 36" O.C.	B-121 2040	Note 2
122	Filter Plate Washwater (N.P.W.)	FPW	Light Gray	2" Red @ 36" O.C.	F-42 2050	
123	Drains (Equipment)	DE	*			
124	Filtered Water (Fountain)	FW	Safety Blue	2" Green @ 30" O.C.	B-5 2045	Note 1
125	Backwash (Filter)	BW	Safety Blue	2" Brown @ 24" O.C.	B-5 2045	
126	Not Used					
127	Not Used					
128	Hydraulic Oil	HO	Black	2" Yellow @ 24" O.C.	J-5 2009	Note 1
129	Overflow (Grit)	OF	Light Gray	2" Black @ 30" O.C.	F-42 2050	Note 1

**SCHEDULE 01340-1
SYMBOL AND COLOR CODES**

Ref. Line	Service	Symbol	Color	Banding	Val Spar & TNE MEC Color No.	Remarks
130	Air	A	Powder Blue	2-2" Green @ 36" O.C.		Note 1
131	Chemical Solution	CHS	Bright Yellow	2" Black @ 24" O.C.	Y-111 2026	Note 1
132	Dewatering (Sumps)	DW(S)	Cinnamon	6" Green @ 72" O.C.	D-106 2003	Note 1
133	Liquid Nitrogen	LIN	White	2" Yellow @ 72" O.C.	W-9 2000	
134	Nitrogen Gas	NG	White	2" Red @ 72" O.C.	W-9 2000	
135	Nitrogen + Oxygen	N + O	White	2" Blue @ 72" O.C.	W-9 2000	

Legend:

Note 1 - All piping and appurtenances including pumps and motors, etc.

Note 2 - All piping and appurtenances including Venturi Meters, etc.

* - Color as per Color Schedule for same service

SECTION 01350

RECORD DOCUMENTS

PART 1 – GENERAL

1.01 General

- A. Contractor shall maintain and provide the Engineer with record documents as specified below, except where otherwise specified.
- B. Maintenance of Documents
 - 1. Maintain in Contractor's field office in clean, dry, legible condition complete sets of the following: Drawings, Specifications, Addenda, approved Shop Drawings, Photographs, Change Orders, other modifications of Contract Documents, Field Orders, and all other documents pertinent to Contractor's Work.
 - 2. Provide files and racks for proper storage and easy access. File in accordance with filing format of Construction Specification Institute (CSI), unless otherwise approved by Engineer.
 - 3. Make documents available at all times for inspection by Engineer and Owner.
 - 4. Record documents shall not be used for any other purpose and shall not be removed from the Contractor's office without Engineer's approval.
- C. Marking System: Provide colored pencils or felt tipped pens for marking changes, revisions, additions and deletions, to the record set of Drawings. Use following color code unless otherwise approved by the Engineer.
 - 1. Structural: Red
 - 2. Other Printed Notations: Green
- D. Recording
 - 1. Label each document "PROJECT RECORD" in 2-inch high printed letters.
 - 2. Keep record documents current.

3. Do not permanently conceal any work until required information has been recorded.
4. Drawings: Legibly mark to record actual construction including:
 - a. Field changes of dimensions and details
 - b. Changes made by Change Order or Field Order.
 - c. Details not on original Drawings.
5. Specifications and Addenda: Legibly mark up each Section to record:
 - a. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed or used.
 - b. Changes made by Change Order or Field Order.
 - c. Other matters not originally specified.

E. Submittal

1. Upon Substantial Completion of the work, deliver record documents to the Engineer. Final payment will not be made until satisfactory record documents are received and approved by the Engineer.
2. Accompany submittal with transmittal letter containing:
 - a. Date
 - b. Project title and number.
 - c. Contractor's name and address.
 - d. Title and number of each record document.
 - e. Certification that each document as submitted is complete and accurate.
 - f. Signature of Contractor, or his authorized representative.

*** END OF SECTION ***

SECTION 01360

SCHEDULE OF VALUES

PART 1 – GENERAL

1.01 Schedule of Values

A. General

1. The Contractor shall, within two weeks of executing the Contract, submit a Schedule of Values accurately breaking down the contract price into logical categories of work. This Schedule of Values shall be submitted to the Engineer for approval. Any items not acceptable to the Engineer shall be substantiated to the satisfaction of the Engineer or amended to the satisfaction of the Engineer. Upon approval by the Engineer, the Schedule of Values shall serve as the basis for the Contractor's application for payment, which shall be made on **AIA Document G702 Application and Certification for Payment**.
2. Upon request, submit documentation to support the values assigned to the Goods and Special Services. Sum of all values shall equal the Total Contract Price less any Allowances.
3. The following is a list of the minimum categories to be contained in the Schedule of Values. The Contractor may propose additional categories to improve the utility of the Schedule.
4. Each of the following categories shall be broken into subcategories for labor and materials.

1.02 Minimum List of Categories

Title

General Conditions
Mobilization
Submittals
Project Schedule

Job Supervision
Record Documents
By-Pass Piping Systems

Demolition

Concrete

Mechanical

Mobilization
Pumps
Valves
Wet Well Modifications
Flow meter
Sampling System
Piping
Fittings
Pipe hangers and supports
Painting
Piping ID and Valve Tags
Testing

Electrical

Mobilization
Branch Wiring
Feeders
Mech. Equipment
Panels
Conduit
Instrumentation and Controls

*** END OF SECTION ***

SECTION 01500

TEMPORARY FACILITIES

PART 1: GENERAL

1.01 CONTRACTOR'S FIELD OFFICE

- A. Temporary offices shall be established on the job site where shown on the Drawings, adequately furnished and maintained in a clean, orderly condition by the Contractor. The Contractor or his authorized representative shall be present in the field office at all times while work is in progress. Instructions received there from the Engineer shall be considered as delivered to the Contractor.
- B. The field office shall be of adequate size to accommodate the Contractor's staff and provide suitable space for project meetings. The office shall be provided with adequate lighting, heating and air conditioning; telephone service; file cabinets and plan racks; conference table and chairs for project meetings; and sanitary facilities for his staff. The field office may be constructed on site or may be a portable or mobile unit designed for the use.
- C. Contractor shall be responsible for and shall pay for any local permits required for placement of Contractor's temporary offices and facilities and for use of all utilities for offices and construction purposes.

1.02 TEMPORARY LIGHT AND POWER

- A. Furnish temporary light and power, including 220 Volt service for welding, complete with wiring, lamps and similar equipment as required to adequately light all work areas and with sufficient power capacity to meet the reasonable needs of all subcontractors. Make all necessary arrangements with the local electric company for temporary electric service and shall pay all expenses in connection therewith for the duration of the project.
- B. Install circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction-type power cords.
- C. Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. For connection of power tools and equipment, provide outlets equipped with ground-fault circuit interrupters, reset button and pilot light.
- D. Provide grounded extension cords. Use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if more than one length is required.
- E. Provide general service incandescent lamps as required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

1.03 TEMPORARY HEATING, COOLING AND VENTILATING

- A. Provide temporary heating, cooling and ventilating as required to maintain adequate environmental conditions to facilitate progress of the work, to meet specified minimum conditions for the installation of materials and to protect materials and finishes from damage due to temperature or humidity.
- B. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity and to prevent hazardous accumulations of dust, fumes, vapors or gases.
- C. Portable heaters shall be standard approved units complete with controls.
- D. Provide all heat as may be necessary for thawing out and heating the ground, materials, form work for concrete cure and for proper execution, protection and drying out of the Work.

1.04 TEMPORARY WATER

- A. Arrange with the Owner to obtain water for construction purposes from the Owners existing water system. The size of the water line connection shall not exceed 2-in or as approved by the Owner.
- B. Install branch piping with taps located so that water is available throughout the construction by the use of hoses. Protect piping and fittings against freezing as applicable to the work site.
- C. Install at each and every connection to the Owner's water supply a backflow preventor meeting the requirements of ANSI A40.6, latest revision and the Owner's requirements. Contractor shall meter all water used, however, the Contractor will not be charged for water usage.

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities in compliance with laws and regulations.
- B. Service, clean and maintain facilities and enclosures.

1.06 WEATHER PROTECTION

- A. Furnish, install and maintain temporary heat and enclosures to provide adequate working areas for Contractor's and subcontractor's personnel during the months of November through March.
- B. Temporary heating units shall have been tested and labeled by UL, FM, or other recognized association related to the type of fuel being used.

1.07 TEMPORARY AIR AND STEAM

- A. Provide all air and steam, including temporary piping and appurtenances required for cleaning and testing pipelines and equipment necessary for Contractor's and subcontractor's work. Remove temporary piping and appurtenances upon approval of equipment being tested.

1.08 FIRE EXTINGUISHERS

- A. Provide portable UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide portable UL-rated Class ABC dry chemical extinguishers or a combination of NFPA recommended Classes for the exposure. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

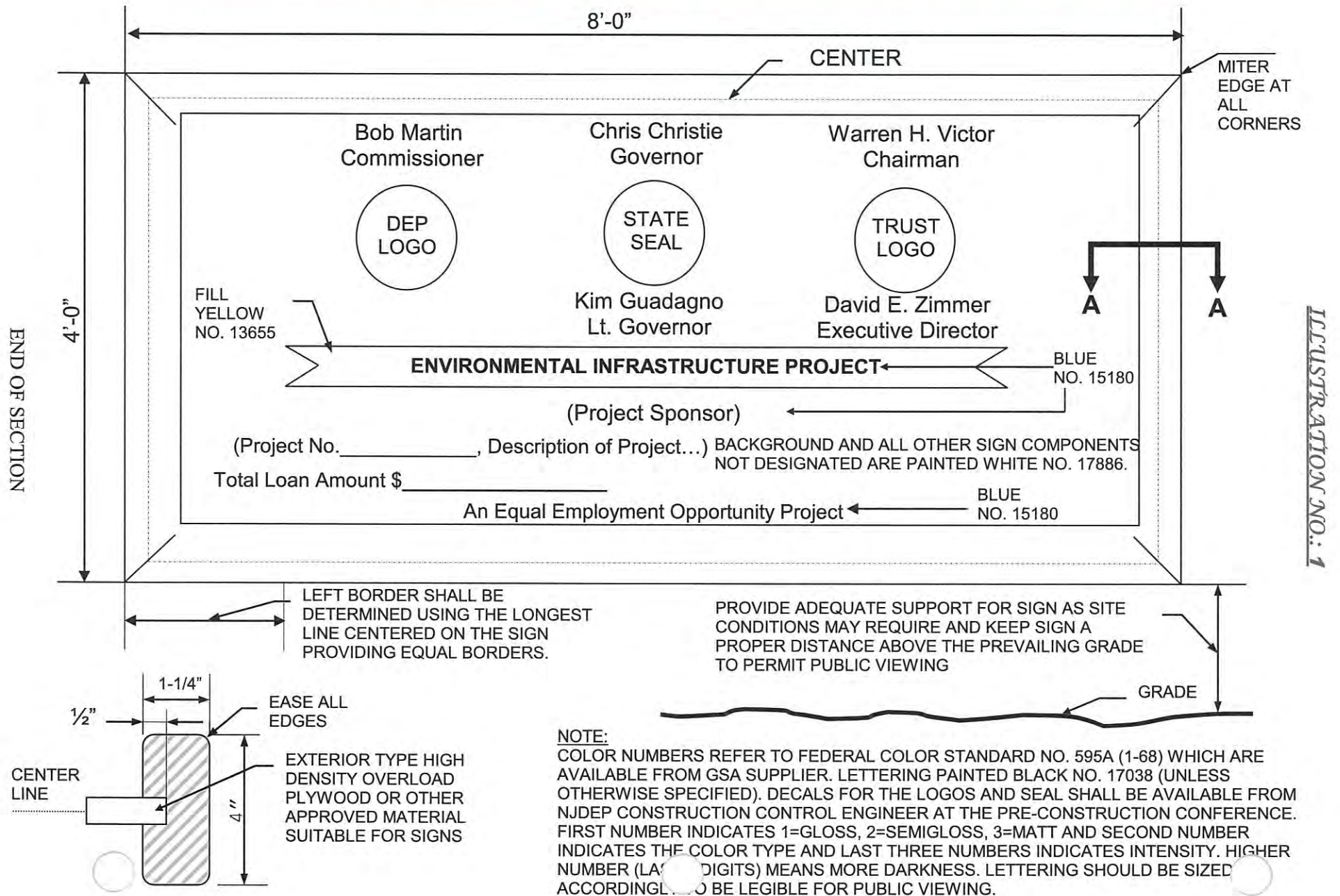
1.09 PUBLICITY AND PROJECT SIGNS

- A. The Contractor shall erect two project signs at the project site which shall include Title of Project and Contract Number, Name of Owner, Names and titles of Officials, Name of Contractor and Names of Consulting Engineers. Names and titles of officials to be included will be furnished to the Contractor after award of Contract. The layout of the sign shall be submitted for approval by the Engineer and shall be similar to the sign attached to this section.
- B. The sign shall be 4 feet high by 8 feet long and supported on vertical posts. The sign panels shall be constructed of $\frac{3}{4}$ -inch minimum thickness marine grade plywood rabbeted into a 2" x 4" frame with vertical intermediate supports, 24-inches on center, maximum. Each plywood panel shall be resin impregnated on both sides. All fasteners used in the construction of the sign shall be of a rust proof nature. The colors for the Project Sign shall be selected by the Engineer. All supports, trims and the back of the sign panels shall be painted with at least two coats of the same paint used for the sign face. All paint used shall be exterior grade paint, suitable for use on wood signs. The supports, framing and sign surfaces shall be able to withstand winds of 100 miles per hour.
- C. The signs shall be furnished, erected and maintained by the Contractor in a prominent location at each publicly visible project site and facility as designated by the Engineer.

1.10 REMOVAL

- A. Completely remove all temporary materials and equipment when their use is no longer required.
- B. Clean and repair damage caused by temporary installations or use of temporary facilities.
- C. Remove field offices, contents and services from the site. The Engineers field offices and temporary trailers shall become the property of the Contractor. Remove foundations and debris and grade area to required elevations.
- D. Restore permanent facilities used for temporary services to specified condition.

ENVIRONMENTAL INFRASTRUCTURE PROJECT SIGN DETAILS



SECTION 01600

MATERIAL AND EQUIPMENT

PART 1: GENERAL

1.01 REQUIREMENTS INCLUDED

A. Material and equipment incorporated into the Work:

1. Conform to applicable specifications and standards.
2. Comply with size, make, type and quality specified, or as specifically approved in writing by the Engineer.
3. Manufactured and Fabricated Products:
 - a. Design, fabricate and assemble in accord with the best engineering and shop practices.
 - b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 - c. Two or more items of the same kind shall be identical, by the same manufacturer.
 - d. Products shall be suitable for service conditions.
 - e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specially approved in writing.
4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.02 RELATED WORK

- A. Conditions of the Contract
- B. Summary of Work is included in Section 01010.
- C. Shop Drawings, Working Drawings, Product Data and Samples are included in Section 01300.
- E. Operating and Maintenance Data is included in Section 01330.
- F. Warranties and Bonds are included in Section 01740.

1.03 APPROVAL OF MATERIALS

- A. Only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the Contractor shall be subject to the inspection and approval of the Engineer. No material shall be delivered to the work without prior approval of the Engineer.

- B. Within 30 days after the Effective Date of the Agreement, the Contractor shall submit to the Engineer, data relating to materials and equipment he proposes to furnish for the work. Such data shall be insufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications. The data shall comply with Paragraph 1.06 of this Section.
- C. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, the Contractor shall submit samples of materials for such special tests as may be necessary to demonstrate that they conform to the specifications. Such samples shall be furnished, stored, packed, and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for the tests.
- D. The Contractor shall submit data and samples sufficiently early to permit consideration and approval before materials are necessary for incorporation in the work. Any delay of approval resulting from the Contractor's failure to submit samples or data promptly shall not be used as a basis of claim against the Owner or the Engineer.
- E. The materials and equipment used on the work shall correspond to the approved samples or other data.

1.04 MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION

- A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including five copies to the Engineer.
 - 1. Maintain one set of complete instructions at the job site during installation and until completion.
- B. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
 - 1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further requirements.
 - 2. Do not proceed with work without clear instructions.
- C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.05 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of Products in accordance with construction schedules coordinate to avoid conflict with work and conditions at the site.
 - 1. Deliver Products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that Products are properly protected and undamaged.

B. Provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

1.06 STORAGE AND PROTECTION

A. Storage of equipment shall be in strict accordance with the "instructions for storage" of each equipment supplier and manufacturer including connection of heaters, placing of storage lubricants in equipment, etc. Furnish a copy of the manufacturer's instructions for storage to the Engineer prior to storage of all equipment and materials. Corroded, damaged or deteriorated equipment and parts shall be replaced before acceptance of the project. Equipment and materials not properly stored will not be included in a payment estimate. The location for the storage of equipment shall be as directed by the Engineer and Owner.

B. Store Products in accord with manufacturer's instructions, with seals and labels intact and legible.

1. Store products subject to damage by the elements in weather tight enclosures.

2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

3. Store fabricated products above the ground, on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.

C. All materials to be incorporated in the work shall be handled and stored by the Contractor before, during, and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.

E. All materials which, in the opinion of the Engineer, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the work, and the Contractor shall receive no compensation for the damaged material or its removal.

F. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored Products to assure that Products are maintained under specified conditions, and free from damage or deterioration.

G. Protection after Installation:

1. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove covering when no longer needed.

H. The Contractor shall be responsible for all material and supplies sold and delivered to the Owner under this Contract until final inspection of the work and acceptance thereof by the Owner. In the

event any such material and supplies are lost, stolen, damaged, or destroyed prior to final inspection and acceptance, the Contractor shall replace same without additional cost to the Owner.

- I. Should the Contractor fail to take proper action on storage and handling of material supplied under this Contract within seven days after written notice to do so has been given, the Owner retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the Contractor's Contract. These costs may be comprised of expenditures of labor, equipment usage, administrative, clerical, engineering and any other costs associated with making the necessary conditions.

1.07 SPECIAL TOOLS

- A. Manufacturers of material shall furnish any special tools required for normal adjustment, operations and maintenance, together with instructions for their use. The Contractor shall preserve and deliver to the Owner these tools and instructions in good order prior to completion of the Contract.

1.08 STORAGE AND HANDLING OF EQUIPMENT ON SITE

- A. Because of the long period allowed for construction, special attention shall be given to the storage and handling of equipment on site. As a minimum, the procedure outlined below shall be followed.
 1. Equipment shall not be shipped until approved by the Engineer. The intent of this requirement is to reduce on-site storage time prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer. Operation and Maintenance data as described in Section 01730 shall be submitted to the Engineer for review prior to shipment of equipment.
 2. All equipment having moving parts such as gears, electric motors, etc, and/or instruments shall be stored in a temperature and humidity controlled building approved by the Engineer, until such time as the equipment is to be installed.
 3. All equipment shall be stored fully lubricated with oil, grease, etc, unless otherwise instructed by the manufacturer.
 4. A copy of the manufacturer's storage instructions shall be given to the Engineer and shall be carefully studied by the Contractor and reviewed with the Engineer by him. These instructions shall be carefully followed and a written record of this kept by the Contractor.
 5. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

6. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. Mechanical equipment to be used in the work, if stored for longer than ninety days, shall have the bearings cleaned, flushed and lubricated prior to testing and startup, at no extra cost to the Owner.
7. Prior to acceptance of the equipment, have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

1.09 SPARE PARTS

- A. Spare parts for certain equipment provided under Divisions 15 and 16 have been specified in the pertinent Sections. Collect and store all spare parts as required by the manufacturer. In addition, furnish to the Engineer an inventory listing all spare parts, the equipment they are associated with, the name and address of the supplier and the delivered cost of each item. Copies of actual invoices for each item shall be furnished with the inventory to substantiate the delivered cost. Deliver the spare parts to the Owner not later than 10 days prior to plant start-up.

PART 2: PRODUCTS (NOT USED)

PART 3: EXECUTION (NOT USED)

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
 - 1. Closeout procedures.
 - 2. Final cleaning.
 - 3. Adjusting.
 - 4. Project record documents.
 - 5. Spare parts and maintenance materials.

1.02 RELATED WORK

- A. Operation and Maintenance Data are included in Section 01330.
- B. Warranties and Bonds are included in Section 01740.
- C. Additional closeout procedures are included in Sections 00700.

1.03 RECORD DOCUMENTS

- A. Record Documents shall be maintained in accordance with Section 01350.

1.04 CLOSEOUT PROCEDURES

- A. Submit in accordance with Article 14 of the Conditions of the Contract written certification that Contract Documents have been reviewed, work has been inspected and that work is complete in accordance with Contract Documents and ready for Engineer's inspection.
- B. Provide submittals to Engineer that are required by governing or other authorities.
- C. Submit Application for Final Payment identifying total adjusted Contract Sum, previous payments and sum remaining due.

1.05 SUBSTANTIAL COMPLETION

- A. When the Contractor considers the Work to be Substantially Complete, he shall submit to the Engineer:
 - 1. A written notice that the Work, or designated portion thereof, is substantially complete.
 - 2. A list of items to be completed or corrected.
- B. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to determine the status of completion.
- C. Should the Engineer determine that the Work is not Substantially Complete:
 - 1. The Engineer will notify the Contractor in writing, giving the reasons therefore.
 - 2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Engineer.
 - 3. The Engineer will reinspect the Work.

1.06 FINAL INSPECTION

- A. When Contractor considers the Work is complete, he shall submit written certification that:
 - 1. Contract Documents have been reviewed.
 - 2. Work has been inspected for compliance with Contract Documents.
 - 3. Work has been completed in accordance with Contract Documents.
 - 4. Equipment and systems have been successfully tested in the presence of Owner's representatives and are operational.
 - 5. Work is completed and ready for final inspection.
- B. The Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should the Engineer consider that the Work is incomplete or defective:
 - 1. The Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.
 - 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to the Engineer that the Work is complete.
 - 3. The Engineer will reinspect the Work.

- D. When the Engineer finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittal.

1.07 REINSPECTION FEES

- A. Should the Engineer perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
 - 1. Owner will compensate the Engineer for such additional services.
 - 2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.08 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

- A. Evidence of compliance with requirements of governing authorities.
- B. Project Record Documents.
- C. Operation and Maintenance Data, and Care and Cleaning Instruction: In accordance with requirements of Section 01730.
- D. Warranties and Bonds: In accordance with requirements of the General Conditions and Section 01740.
- E. Tools, Spare Parts and Maintenance Material: To requirements of Section 01170.
- F. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.

1.09 FINAL CLEANING

- A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
 - 1. Remove labels that are not permanent labels.
 - 2. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances
 - 3. Wipe surface of mechanical and electrical equipment. Remove excess lubrication and other substances.

1.10 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to the Engineer.
- B. Statement shall reflect all adjustments to the Contract Sum:

1. The original Contract Sum.
 2. Additions and deductions resulting from:
 - a. Previous Change Orders.
 - b. Allowances.
 - c. Unit Prices.
 - d. Deductions for uncorrected Work.
 - e. Deductions for reinspection payments.
 - f. Other adjustments.
 3. Total Contract Sum, as adjusted.
 4. Previous payments.
 5. Sum remaining due.
- C. Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.11 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the General Conditions. Costs for reinspections due to failure of the Work to comply with Contractor's representations of status of completion shall be deducted from amounts due and payable to Contractor.

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1.02 RELATED WORK

- A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.
- B. General closeout requirements are included in Section 01700 Project Closeout.
- C. Specific requirements for warranties for the work and products and installations that are specified to be warranted, are included in the individual Sections of Division 2 through 16.

1.03 SUBMITTALS

- A. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the work, or a designated portion of the work, submit written warranties upon request of the Owner.
- B. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner within 15 days of completion of that designated portion of the Work.
- C. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for approval prior to final execution.
- D. Refer to individual Sections of Divisions 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.

1.04 WARRANTY REQUIREMENT

- A. All equipment warranties will have a minimum duration of coverage not less than 12 complete months starting on the date of final acceptance of the equipment by the Owner unless otherwise stated in individual Sections of Division 2 through 16.
- B. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

- C. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- D. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the work through a portion of its anticipated useful service life.
- E. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- F. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- G. The Owner reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- H. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the Contractor.

1.05 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01750

MAINTENANCE OF PLANT OPERATIONS DURING CONSTRUCTION

PART 1: GENERAL

1.01 GENERAL REQUIREMENTS

- A. The existing PVSC Facilities [i.e. wastewater treatment plant (both process and non-process) and pumping stations] will be maintained in continuous operation by the Owner during the entire construction period and will facilitate specific shutdown periods for the Work of this contract as described in Part 3 of this specification. Work under the contract shall be so scheduled and conducted by the Contractor such that work will not impede any treatment process, create potential hazards to operation or equipment, reduce the quality of the effluent or cause odor or other nuisance. In performing the work shown as specified, the Contractor shall plan and schedule the work to meet the operating requirements and additional constraints outlined in this Section.
- B. The Contractor has the option of providing additional temporary facilities that can eliminate a constraint, provided it is done without cost to the Owner, and provided that all requirements of these specifications are fulfilled. Work not specifically covered in the following paragraphs may, in general, be done at any time during the contract period, subject to the operating requirements outlined hereinafter. All references to days in this Section are to be construed as consecutive calendar days, and all references to "continuous" in this section are to be construed as uninterrupted until completed.
- C. The intent of this section is to have the Contractor perform the work in such a manner that continuous, uninterrupted treatment and all essential services and facilities are maintained operational throughout the construction period.
- D. The Contractor is hereby advised that he/she shall not shut off or disconnect any operating system of the existing PVSC Facilities. All equipment shutdowns shall be executed by the Owner.
- E. For brevity the Contractor is advised that this Section of the Specifications contains several references to equipment, piping, material and appurtenances to be removed or reinstalled. The Contractor shall refer to other specification sections and the Contract Drawings for definition of the equipment, piping, material and appurtenances to be removed from the site by the Contractor.
- F. The descriptions of work herein are complementary and supplementary to the Contract Drawings and Specifications, and do not negate any work required by either, and do not purport to represent every element or detail of work to be performed or every operational or construction constraint which may be required.
- G. All work described herein shall be performed by the Contractor unless otherwise noted.
- H. Any Contractor's activities during the period of 4:15 P.M. to 7:45 A.M. must have prior approval of the Owner.
- I. The costs for all temporary facilities, maintenance of services, and all other work specified in these specifications shall be borne by the Contractor unless specifically stated otherwise. The costs for all the aforementioned work is deemed included in the lump sum bid price.

- J. PVSC specific forms for Energy Source Control, Temporary Use of Owner Equipment and Equipment Lock-Out, Tag-Out are included at the end of this Section. These forms shall be submitted where applicable prior to the performance of any associated Work.

1.02 GENERAL CONSTRAINTS

In this Section, the recommended sequence and shutdown of units, which are to be taken out-of-service, are presented. The operational status of new or existing units other than the designated units shall not be interrupted by the General Contractor or Subcontractors during the specified time periods. New units may only be used after the specified testing and acceptance of the new units.

The following constraints shall be applied to all equipment, treatment units and appurtenant utility systems on the project site.

A. Access to Project Site

An unobstructed traffic route at the entrance must be maintained at all times. Vehicular access to all treatment units and buildings must be maintained at all times. Any work requiring the temporary closing of a road to traffic must be coordinated with the Owner.

B. Vehicular Access

Except as otherwise permitted, vehicular access to all portions of the buildings and utility tunnels must be maintained at all times.

C. Personnel Access

PVSC Personnel must have safe access to all areas remaining in operation throughout the construction period. Construction site and staging areas shall be maintained in a neat and workmanlike condition. This includes but is not limited to rubbish removal, cutting grass and removing weeds on a regular basis, grading to eliminate potholes, ponding, ruts, etc., as well as dust control and proper material and equipment storage.

The Contractor is informed that PVSC Personnel utilize the utility tunnels (located at the wastewater treatment plant) to transport equipment and materials between buildings and that this access should be maintained throughout the construction period.

D. Plant Utility Systems

1. The existing potable and non-potable water systems shall be kept in operation at all times. All connections to the plant potable and non-potable water systems shall be approved by the Owner prior to installation. All potable water system connections shall contain protective devices as required by the Health Department or applicable code.
2. Existing fire hydrants within the plant site shall be operational at all times.
3. Storm drainage on the site shall be operational at all times.

4. Electric power, lighting service and communication systems shall be maintained in uninterrupted operation mode in all areas remaining in operation. Temporary power shall be provided where required.

E. Plumbing Facilities

Except as otherwise permitted, all building plumbing systems such as roof and floor drains, sump pumps and other systems shall remain in operation.

F. Special Protection of Machinery and Equipment

The Contractor shall take all protective measures to the satisfaction of the Engineer necessary to insure that inclement weather, or dust and debris from demolition does not enter any of the mechanical or electrical equipment enclosures. Enclosures shall be provided where necessary to prevent contamination of the air. All protective measures shall be furnished, installed, lighted, ventilated, maintained and removed at the Contractor's own cost.

Interior dustproof covers shall be a heavy reinforced polyethylene film curtain, minimum thickness 6 mils, supported by wood framing. All seams and penetrations shall be sealed with duct tape on two sides. Junctions with existing walls, floors and ceilings shall be made with a double fold secured with a backing strip anchored to the existing wall, floor and ceiling.

Exterior weather tight enclosures shall be provided whenever a section of a roof or exterior wall on an existing building is removed or equipment is installed in a new building.

The Contractor shall be responsible for all damage to existing structures, equipment, and facilities caused by his/her construction operation and must repair all such damage when and as ordered at no additional cost to the Owner.

G. Service Interruptions

1. When a construction task requires a suspension of normal operations of an individual treatment unit or an individual equipment system for a period less than twenty-four (24) continuous hours, the suspension shall be considered a service interruption. For each service interruption, the Contractor shall compile an inventory of the labor and materials required to perform the work, an estimate of the time required and a written description of the steps required to complete the task resulting in a service interruption. The inventory, time estimate and written procedure shall be submitted to the Owner for review thirty days prior to the start date of the task. If the proposed procedure submitted by the Contractor is acceptable, the Owner shall authorize in writing, the service interruption pending the verification of materials and labor and the final notification specified herein.
2. No service interruption shall be initiated until the Engineer verifies the list of materials and labor at the site at least one week prior to the proposed start date. After verification of the list of materials and labor, the Contractor shall notify the Engineer of the exact date that he/she wishes to perform the work in writing two normal working days, excluding Saturdays, Sundays and holidays, prior to the proposed date.
3. When the normal operations of a treatment unit are suspended longer than twenty-four hours, then the procedures for a shutdown, specified hereinafter, shall be enforced.

4. Forms included at the end of this section must be used to request shutdowns and service interruptions.

H. Shutdowns

1. Shutdown shall be defined to indicate that the normal operation of a unit has to be suspended or taken out-of-service for more than twenty-four hours in order to perform specified work.
2. For each shutdown the Contractor shall compile an inventory of its labor and materials required to perform the tasks, an estimate of the time required and a written description of the steps required to complete the tasks. The inventory, time estimate and written procedure shall be submitted to the Engineer for review thirty (30) calendar days prior to the start date of the shutdown. The Contractor shall also request in writing, from the Engineer approval for each shutdown a minimum of fourteen (14) calendar days prior to the proposed initiation date. No shutdown shall be initiated until the list of materials, labor and equipment is verified as on site or in the Contractor's secure storage area at least one week prior to the proposed start date.
2. The work specified herein and any other work required at the request of the Owner, which may interrupt the normal operations, shall be accomplished at such times that will be convenient to the Owner.
3. The Contractor shall also have on hand, located in close proximity to the work area(s), all tools, equipment and materials, both temporary and permanent, necessary to complete each work category, without interruption. Where temporary pumping is required, contractor shall have on hand 100% backup for the largest unit installed. Prefabrication of all piping and other assemblies shall be completed to the greatest degree possible, prior to any shutdowns. The Engineer must be satisfied that the Contractor has complied with these requirements, to the fullest extent possible, before any shutdowns will be authorized. Once any shutdown is initiated, work shall be continuous until completed.
4. The Contractor must remove the contents in all cases from any tank, conduit or pipe during a shutdown longer than twenty-four continuous hours.
5. Contractor shall tag out all valves and equipment which are shutdown by the Owner indicating valve/equipment status for the shutdown duration to insure the Owner and Contractor are both fully aware of valve/equipment status during shutdown, and to eliminate an uncoordinated valve/equipment operation.

I. Shutdown of Electrical Systems

For electrical shutdowns, the Contractor shall notify the Engineer of the exact date he wishes to perform the work in writing seven (7) normal working days excluding Saturdays, Sundays and holidays prior to the proposed date.

After the final notification and with the approval of the Owner and Engineer, Lock-Out Tag-Out forms located at the end of this Section shall be completed. The Contractor shall lock out and tag existing circuit breakers, motor starters and switches, which shall be operated by the Owner. The Contractor shall check cables and wires to be sure that they are denergized to ground potential before work begins. Upon completion of the work, the Contractor shall notify the Owner and Engineer that the facilities are available for use. With the approval by the Owner and Engineer, the Contractor shall remove the locks and tags from the circuit breakers, motor starters or switches. The Contractor shall not operate any existing electrical equipment without the approval, direction and supervision of the Owner or the Engineer.

J. Overtime

Overtime work by the Contractor necessary to conform to these requirements shall be considered as normal procedure under this Contract, and the Contractor shall make no claims for extra compensation as a result thereof. The Contractor shall be prepared to work around the clock and supply multiple work crews as necessary to complete the work including testing and acceptance as specified, within the specified time frame.

K. Load Limits on Access Roads and Plant Facilities

Existing and new underground facilities such as electrical duct banks, pipelines, etc., in, under, and crossing plant roads have been designed for a maximum wheel load in accordance with AASHTO H-20. Contractor shall not exceed this weight limit.

Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressure that will endanger it. For all construction activities that require a crane, heavy machinery, etc., the Contractor shall submit a safe structural loading analysis on the existing facilities. Review of the analysis is required before any work can proceed. The analysis shall require a Professional Engineer's Certification from the State of New Jersey as part of the submittal to the Engineer. Contractor shall take all provisions necessary to distribute concentrated loads due to cranes and heavy machinery.

L. Emergency Repair Crews

In case the Contractor's operations disrupt the treatment process or the minimum operating facilities hereinbefore described, at any time, he/she shall at his/her own expense immediately make all repairs or replacements and do all work necessary to restore the plant to operation to the satisfaction of the Owner.

Such work shall progress continuously to completion on a 24-hour day, seven work-day week basis. The Contractor shall provide the services of emergency repair crews, available on call 24 hours per day.

M. Use of Existing Plant Hoisting Equipment and Tunnel Access Elevators

Use of existing plant hoisting equipment and tunnel access elevators by the Contractor will be permitted at the discretion of the Owner. If use is permitted the Contractor shall complete the Equipment Use Agreement form appended to the end of this Section. The Contractor shall inform the Owner of the hoisting equipment and tunnel access elevators the Contractor plans to utilize for approval by the Owner prior to usage. The Contractor shall inspect the hoisting equipment and tunnel access elevators prior to use, report any existing damage to the Owner and Engineer, and make any necessary repairs as a result of damage caused by the Contractor's use at no additional cost.

1.03 TEMPORARY POWER

- A. All work necessary to provide temporary power for maintaining plant operations as described herein below and in Division 16, or as otherwise required, shall be performed by the Contractor. All temporary power facilities shall be furnished in accordance with applicable codes.
- B. The Contractor shall submit a plan for providing the temporary plant power source and for all temporary facilities to be provided for the Engineer's review. The plan shall describe the temporary power installation and identify the type and location of component equipment to be provided.

1.04 SEQUENCE OF CONSTRUCTION AND OPERATION

- A. In order to maintain continuous operation during construction to the existing wastewater treatment plant facilities, a phased removal and construction sequence shall be required. The Contractor is advised that work may be required to be performed in multiple areas simultaneously in order to complete the entire scope of the Contract within the allotted time.

PART 2: PRODUCTS (NOT USED)

PART 3: EXECUTION

3.01 ELECTRICAL POWER

- A. Waste Activated Sludge (WAS) Pump MCCs
 - 1. General
 - a. The WAS Pump MCC houses existing VFDs for WAS pumps 1 thru 4. The VFDs are to be re-used.
 - 2. Related Work
 - a. Replacing the WAS Pumps.
 - 3. Timing and Constraints
 - a. New wire shall be pulled to each pump one at a time when the pumps are removed from service.
 - b. See the "*Replacement of WAS Pumps*" section for Execution details.

3.02 INSTALLATION OF FLOOR CONES AND ISOLATION VALVES

A. Floor Cones, Suction and Discharge Isolation Valves

1. General

- a. Four (4) new floor cones will be installed in the influent well below the suction bells for the WAS pumps. Four (4) suction isolation valves shall be replaced on the WAS pumps. Four (4) discharge isolation valves shall be replaced on the WAS pumps. The installation of the floor cones and replacement of the isolation valves shall take place during two (2) service interruptions of the WAS pumps as described in paragraph 3 & 4 of this section. Each service interruption shall not exceed 4 hours.

2. Related Work

- a. Replacement of the WAS pumps
- b. Installation of meter piping

3. Timing and Constraints

- a. The installation of four (4) new floor cones and four (4) suction isolation valves shall take place during one (1), 4 hour service interruption of the WAS Pumps and wet well. This work will require the wet well to be drained prior to the installation of floor cones.
- b. The installation of four (4) discharge isolation valves shall take place during a separate, 4 hour service interruption of the WAS Pumps.
- c. The work shall be performed prior to the replacement of the WAS Pumps.
- d. The two service interruptions described herein shall take place in a two week span.

4. Execution

- a. The Contractor shall set up a 1 mgd mud sucker pump above the wet well and run temporary piping to the RAS pump effluent channel
- b. Owner shall shut the 6-foot slide gates to the influent well.
- c. The Contractor shall drop the mud sucker pump into the influent well, connect piping and power up pump as quickly as possible while the Owner operates the Archimedes screw pumps to draw the influent well down to 1.5 feet in depth.
- d. The Contractor shall drain the influent well and clean all accumulation of sludge and sediment below the suction bells of the WAS pumps. The concrete shall be ground flat where the cones are to be installed.
- e. The floor cones shall be installed directly beneath the suction bells for each of the four (4) WAS pumps.
- f. The four (4) WAS Pump suction isolation valves shall also be replaced during this service interruption.
- g. Contractor shall remove all equipment from the Influent Well
- h. Owner shall open the sluice gates, start the RAS and WAS pumps and plant shall assume normal operation.
- i. Within two weeks of installing the floor cones and suction valves, the four (4) discharge isolation valves shall be replaced.
- j. Owner shall stop the WAS pumps and close the 12 inch plug valves on the flow meter line and the bypass line, and locally open the pump discharge flow control valves to drain the header back to the influent well.

- k. Contractor shall remove the existing manual 10 inch pump discharge isolation valves and install the new isolation valves. A maximum 4 hour shutdown will be provided for this Work.
 - l. Owner shall open all required valves and re-start the WAS pumps.
5. Plant Operations During Construction
- a. Installation of floor cones and suction/discharge isolation valves will require two (2) service interruptions of the WAS pumps with each service interruption lasting no more than 4 hours.

3.03 REPLACEMENT OF WAS PUMPS

A. Replacement of WAS Pumps

- 1. General
 - a. The work of this item includes the installation of temporary bypass piping, replacement of four (4) WAS pumps (Pump no. 1, 2, 3 and 4), gages and seal water systems, replacement of four motor actuated pump check valves and replacement of suction and discharge piping as shown on the drawings.
 - b. Contractor shall prepare temporary piping drawings for approval prior to performing work.
- 2. Related Work
 - a. Installation of floor cones and isolation valves.
 - b. Installation of meter piping
- 3. Timing and Constraints
 - a. This work shall be done after to the installation of floor cones and isolation valves.
 - b. This work shall be done prior to the Work of Item 3.04.
 - c. The work of Item 3.04 shall commence immediately after the completion of the work of this Item.
 - d. The replacement of pumps and related appurtenances shall take place one pump at a time in the order described below.
 - e. The Pump No. 1 and No. 2 temporary discharge piping shall be installed from the connection at the 10-inch WSL/CSL line up to vicinity of the pumps prior to, or concurrent with demolition of Pump No.1.
- 4. Execution
 - a. Owner shall lock out Pump No. 4 and close suction and discharge isolation valves. Contractor shall replace Pump No. 4, mount existing actuator on new flow control valve, install related piping, supports and valve, contractor shall install new seal water piping system and gage assemblies. Motors shall be wired, Owner shall energize VFD, contractor shall check for proper rotation.
 - b. Owner shall open the pump isolation valves and the contractor shall operate the pump to the system and conduct field performance tests. Contractor shall correct any deficiencies prior to starting demolition of Pump No. 3.
 - c. Step a. and b. shall be repeated for Pump No. 3.

- d. Owner shall close valves SSC 2-1, WS 2-2 and WS 2-3 and WSL/CSL 4-1. Contractor shall dismantle 10-inch WSL/CSL elbow and spool, install temporary piping, meter and temporary pump isolation valves to vicinity of Pump No. 1 and No. 2. Contractor shall adequately support all temporary piping. Contractor shall wire the flow meter in the temporary pipe line.
 - e. Owner shall close Pump No. 1 isolation valves and lock out pump. Contractor shall demolish pump and associated piping, install new pump, suction piping, seal water system, and connect discharge to the temporary piping. Motors shall be wired, Owner shall energize VFD, contractor shall check for proper rotation.
 - f. Owner shall open the pump suction isolation valve and open valve WS 2-2 and the contractor shall operate the pump to the system and conduct field performance tests. Contractor shall correct any deficiencies prior to starting demolition of Pump No. 2.
 - g. Step e. and f. shall be repeated for Pump No. 2. During this period, pump No's. 1, 3 and 4 will be cycled as the active WAS pumps. Pumping through the temporary piping shall be done to ensure integrity of temporary system for the remaining work of this activity and of Item 3.04.
 - h. Contractor shall operate Pump No's 1 and 2 thru the temporary system at full capacity to ascertain smooth operation and piping system integrity.
 - i. Owner shall open valve WS 2-3, close valves WS 2-1, WS 2-2 and WS 2-4, diverting flow to the HTPSR line and the Main Thickener Distribution Box.
 - j. Owner shall stop Pumps No's 3 and 4 close the discharge isolation valves, Contractor shall operate Pump No's 1 and 2 through the temporary piping system.
 - k. Contractor shall commence the Work of Item 3.04.
5. Plant Operations During Construction
- a. Owner shall have use of at least three (3) WAS pumps during pump replacement.

3.04 INSTALLATION OF NEW METER PIPING AND METER BYPASS PIPING

A. Installation of meter piping

1. General
 - a. This work shall include the replacement of the existing 12-inch metering and bypass piping, valves and venturi meter in the Waste Sludge Pump Room. The new work will include the installation of 16-inch meter piping and 16-inch magnetic flow meter, supports and related valves, 16-inch bypass piping, supports and related valves.
2. Related Work
 - a. Installation of floor cones and isolation valves.
 - b. Replacement of WAS pumps
 - c. Installation tapping saddle and hot tap in Item 3.05.
3. Timing and Constraints
 - a. This work shall commence immediately after the completion of the Work of Item 3.03.
 - b. This work shall be performed after the floor cones, isolation valves, and WAS pumps have been installed.
 - c. This installation shall not exceed 72 hours and shall be continuous work.

- d. The tapping saddle work is not constrained, however the WSL line will not be active for the duration of this Work, providing a good opportunity to install the saddle connection on the WSL line.
4. Execution
- a. Owner shall isolate the 6-inch SSC-PVC from the suction source.
 - b. Contractor shall dismantle the 6-inch SSC to extent it interferes with the Work.
 - c. Contractor shall demolish 12 inch meter piping, supports valves and meter, delivering meter and instruments undamaged to the Owner.
 - d. Install new piping, valves, supports, meter as shown on the Drawings and specified.
 - e. Pressure test piping, correct any leaks
 - f. Re-connect 6-inch SSC piping.
 - g. Owner shall open valve WS 2-2, energize Pumps No. 3 and 4 and pump through the HTPSR line.
 - h. Contractor shall certify meter operation.
 - i. Owner shall lock out Pump No. 2 and close the suction isolation valve.
 - j. Contractor shall close the temporary discharge isolation valve, remove temporary piping at Pump No. 2, maintaining the temporary discharge isolation valve, and install permanent discharge piping, supports, gages, flow control valve and actuator.
 - k. Owner shall open the suction and discharge isolation valves, energize Pump No. 2 and pump to the system. Owner may operate any combination of Pump No's 2, 3, 4.
 - l. Owner and Contractor shall repeat steps i, j, and k for Pump No. 1. Owner may operate any combination of pumps.
 - m. Owner shall open valve WS 2-1, close valves WS 2-2 and WS 2-3.
 - n. Contractor shall dismantle and remove all temporary piping and supports, and re-install the permanent 10-inch WSL/CSL piping.
 - o. Owner shall open valves WS 2-2 and WS 2-3 and operate the pumps to test the capacity of the system.
5. Plant Operations During Construction
- a. Owner shall have use of WAS Pumps No. 1 and 2 operating through temporary piping and with a temporary flow meter during piping replacement. The Contactor shall operate the pumps at the Owners requested speeds.

3.05 INSTALLATION OF WSL SAMPLE SYSTEM

A. Installation of WSL Sample System

- 1. General
 - a. This work shall include the installation of the WSL sample system. This system will sample include: sample tap on the 20-inch WSL line, sampling piping to the sampler room, and installation of a composite vacuum sampler and sampler trough.
 - b. Work described in Execution below can be concurrent.
- 2. Related Work
 - a. Installation of New Meter Piping and Bypass Piping
- 3. Timing and Constraints

- a. The installation of the WSL Sample System must be coordinated with PVSC's sampling staff to ensure that work does not interrupt ability for operators to take required samples throughout the plant.
 - b. The new tapping saddle connection on the 20-inch WSL can be performed when the WSL line is depressurized during the Work of Item 3.04, but it is not imperative.
4. Execution
- a. Install hot tap on the 20-inch WSL line and isolation valve.
 - b. Install sample piping from WSL connection to the sampler room.
 - c. Install composite sampler, sampler trough and necessary associated piping in the sampler room.
 - d. Pressure test piping, open valves to establish flow and Test composite sampler system to check proper operation.
5. Plant Operations During Construction
- a. Operators shall have full access to existing samplers in sample room during the installation of the WSL sampler system.

(End of MOPO, Compliance forms follow)

**PASSAIC VALLEY SEWERAGE COMMISSION
CONTROL OF HAZARDOUS ENERGY SOURCES
COMPLIANCE PROGRAM
CONTRACTOR COMPLIANCE FORM**

PURCHASE ORDER #/CONTRACT #: Contract No. A992

OTHER: _____

DATE: _____

CONTRACTOR FIRM: _____

CONTRACTOR PRINCIPAL IN CHARGE: _____

PASSAIC VALLEY SEWERAGE COMMISSION
CONTACT PERSON: _____

BUILDING NAME: _____

ROOM NAME OR NO: _____

FLOOR LEVEL: _____

EQUIPMENT TYPE: _____

EQUIP. LOCATION: _____

EQUIPMENT NAME: _____

EQUIPMENT NO: _____

SEQUENTIAL ITEM #: _____

EQUIPMENT ID: _____

ASSOCIATED EQUIPMENT TO BE LOCKED OUT

EQUIPMENT TYPE: _____

EQUIPMENT ID#: _____

EQUIPMENT TYPE: _____

EQUIPMENT ID#: _____

EQUIPMENT TYPE: _____

EQUIPMENT ID#: _____

EQUIPMENT TYPE: _____

EQUIPMENT ID#: _____

CONTRACTOR CERTIFICATION

I UNDERSTAND THE REQUIREMENTS OF N.J.A.C. 12:100-11.1 ET SEQ. AND HAVE BEEN INFORMED OF THE PASSAIC VALLEY SEWERAGE COMMISSION'S PROCEDURES TO CONTROL HAZARDOUS ENERGY SOURCES FOR THE ABOVE EQUIPMENT. I WILL COMPLY WITH THESE REQUIREMENTS AND ENFORCE COMPLIANCE WITH THESE REQUIREMENTS BY EMPLOYEES OF THE CONTRACTOR.

CONTRACTOR SUPERVISOR-IN-CHARGE SIGNATURE: _____

AGREEMENT FOR CONTRACTOR'S TEMPORARY USE
OF OWNER'S EQUIPMENT

_____ (“the Contractor”), currently performing work under Contract No. A992 hereby agrees with the Owner, for and in consideration of Owner’s consent to the Contractor’s temporary use of Owner’s _____ (“the equipment”), to save and hold Owner harmless of, from and against any and all damage and injury to any property or person whatsoever, including but not limited to the property or person of Owner, the Contractor, their employees and third persons, in addition to any incidental or consequential damages arising therefrom, which damage or any injury arises out of, results from or is in any way caused by the Contractor’s use of the equipment. The Contractor shall indemnify Owner for any and all claims, liabilities, costs and expenses, including attorney’s fees, asserted against or incurred by Owner as a result of or in connection with such damage and injury.

By signing this Agreement, the Contractor acknowledges that the equipment is in good working condition, and agrees to undertake and pay for any and all repairs necessary to return the equipment to Owner in the same working condition after each use by the Contractor, or when deemed necessary by Owner. The Contractor shall reimburse Owner for the cost of any repairs and/or replacements required to be undertaken by Owner when, in the sole judgement of Owner, such repair and/or replacements are needed as a result of Contractors use of the equipment.

The Contractor agrees that temporary use shall be defined as that use of the equipment by the Contractor for construction purposes, at those times as are convenient for and allowed by Owner. Owner’s need to utilize said equipment shall at all times take precedence over the Contractors requirements. Any unavailability of this equipment to the Contractor for whatever reason and for whatever length of time shall under no circumstances give rise to any claims by the Contractors for delays to the work. It is expressly understood and agreed that the Contractors temporary use of this equipment is for his benefit only, and is above and beyond any contractual obligations of Owner.

The Contractor agrees to utilize only those personnel who are fully competent to operate the equipment described and to exercise all safety precautions.

The privileges for use of this equipment may be revoked by Owner at any time, at its discretion.

CONTRACTOR SUPERVISOR-IN-CHARGE SIGNATURE: _____

LOCK-OUT/TAG-OUT REQUEST

DESCRIBE EQUIPMENT TO BE LOCKED OUT _____

COMPANY REQUESTING LOCK-OUT: _____

PERSON RESPONSIBLE FOR LOCK-OUT: _____ TITLE: _____

DATE OF REQUEST: _____

DATE LOCK-OUT REQUIRED: _____

TIME PROPOSED: _____

APPROVALS:

CONTRACTOR: _____ DATE: _____

PVSC: _____ DATE: _____

ENGINEER: _____ DATE: _____

COMMENTS: _____

COMPLETE AREA BELOW WHILE PLACING LOCKS ON EQUIPMENT AND RETURN THIS FORM TO CONTRACTOR'S OFFICE.

TAG NO.	LOCK NO.	INSTALLED BY (NAME)	INITIALS	COMPANY	SYSTEMS AFFECTED	ESTIMATED DURATION	DATE ISSUED	DATE RETURNED

RELEASE FROM LOCK-OUT: (INITIAL EACH & SIGN BELOW)

Contractor has reviewed the equipment & system which was locked out and has found that all PERSONNEL _____, TOOLS _____, and PARTS _____ have been cleared for removal of locks and equipment can be placed back into service.

SIGNED: _____ DATE: _____

NAME (print): _____ TITLE: _____

LOCKOUT AUTHORIZATION FORM

WORK ORDER #/CONTRACT #: _____

CHECK HERE IF SHIFT CHANGE: _____

TIME LOCKS AND TAGS INSTALLED: _____

DATE: _____

CHECK HERE IF SHIFT CHANGE: _____

TIME LOCKS AND TAGS REMOVED: _____

DATE: _____

BUILDING NAME: _____

EQUIPMENT NAME: _____

SEQ. ITEM #: _____

EQUIPMENT ID #: _____

VOLTAGE READING: _____

AFFECTED EMPLOYEES NOTIFIED BY: _____

SIGN-OFF FOR LOCK INSTALLATION

OPERATIONS SUPERVISOR SIGNATURE: _____

MAINTENANCE ELECTRICIAN SIGNATURE: _____

MAINTENANCE SUPERVISOR SIGNATURE: _____

(OR HIS AUTHORIZED MAINTENANCE PERSON)

OTHER SIGNATURE: _____

OTHER SIGNATURE: _____

OTHER SIGNATURE: _____

SIGN-OFF FOR LOCK REMOVAL

OPERATIONS SUPERVISOR SIGNATURE: _____

MAINTENANCE ELECTRICIAN SIGNATURE: _____

MAINTENANCE SUPERVISOR SIGNATURE: _____

(OR HIS AUTHORIZED MAINTENANCE PERSON)

OTHER SIGNATURE: _____

OTHER SIGNATURE: _____

OTHER SIGNATURE: _____

The person signing this agreement is authorized to do so on behalf of the Contractor.

(NAME OF CONTRACTOR)

(AUTHORIZED SIGNATURE)

(PRINT NAME)

DATE: _____

State of _____

County of _____ TO WITNESS

on the _____ day of _____ 20 ____ before me personally

came and appeared _____ to me known, who by

me duly sworn, did depose and say that he is the _____ of _____

and that he has the authority to bind the above named firm to the terms and conditions of

the foregoing Agreement.

My Commission Expires: _____ By: _____

Printed Name: _____

END OF SECTION

SECTION 02050
DEMOLITION

PART 1: GENERAL

1.01 SCOPE OF WORK

- A Furnish all labor, materials, equipment and incidentals required to demolish, modify, alter and convert existing structures, equipment, and pipelines as required for the construction of the new work as shown on the Drawings and as specified herein.
- B Included, but not limited to, demolition and removals of existing materials, equipment, or work necessary to install the new work as shown on the Drawings and as specified herein. Demolition includes complete or partial removal and disposal of structural concrete, foundations, piping, electrical and mechanical equipment, and other existing facilities.
- C Demolitions and removals which may be specified under other Sections shall conform to the requirements of this Section.
- D Where applicable, these specifications call attention to certain activities necessary to maintain and facilitate continuous operation of existing facilities during and immediately following construction and do not necessarily cover all of the required activities. The Contractor shall exercise due concern for existing facilities operation and shall direct all his/her activities toward maintaining continuous operation and minimization of operation inconvenience.
- E Blasting and the use of explosives will not be permitted for any demolition work.

1.02 RELATED WORK

- A Maintenance of Plant Operations during construction is included in Section 01750.
- B. Electrical demolition is included in Division 16.

1.03 SUBMITTALS

- A Submit to the Engineer for approval, six copies of the proposed schedule of intended operations for demolition of existing facilities prior to the start of work. Include in the schedule the coordination of shutoff, capping and continuation of utility services as required.
- B Provide a detailed sequence of demolition and removal work to ensure the uninterrupted operation of the Owner's facilities.
- C Before the start of demolition work, all modifications necessary to bypass the affected structure shall be completed. Actual work shall not begin until the Engineer has inspected, reviewed and authorized the start of the demolition work, in writing.
- D The above procedure must be followed for each individual demolition operation.

1.04 CONDITION OF STRUCTURES

- A The Owner and the Engineer assume no responsibility for the actual condition of any structures to be demolished or modified.
- B Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, variations within a structure may occur prior to the start of demolition work.

1.05 DISPOSAL OF MATERIAL

- A. Salvageable material and equipment listed hereinafter shall become the property of the Owner. Dismantle all such items to a size that can be readily handled and deliver them to a designated storage area.
- B. The following materials and items of equipment shall remain the property of the Owner and stored where directed on the site. Any such material damaged due to improper handling will not be accepted and the replacement value of the material deducted from the payment to the Contractor.
 - 1. One 12 inch venturi tube and associated instrumentation.
 - 2. WAS Pump 4 inclusive of motor.
 - 3. 16-inch tapping saddle w/ 1 inch outlet and ball valve.
- C. Unless otherwise identified and marked by the Owner for his/her use, all other material and items of equipment shall become the Contractor's property and must be removed from the site.
- D. The storage or sale of removed items will not be allowed on the site.

1.06 TRAFFIC AND ACCESS

- A Conduct demolition, modification operations and the removal of equipment and debris to ensure minimum interference with roads, street and walks both onsite and offsite, and occupied or used facilities.
- B Special attention is directed towards maintaining safe and convenient access to any existing facilities by personnel and vehicles.
- C Do not close or obstruct streets, walks or other occupied or used facilities without permission from the Engineer. Provide alternate routes around closed or obstructed access ways.

1.07 PROTECTION

- A Conduct operations to minimize damage by falling debris or other causes to adjacent buildings, structures, roadways, and other facilities, including persons. Provide interior and exterior shoring, bracing, or support to prevent the movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.
- B Exercise precautions for fire prevention. Acceptable fire extinguishing apparatus shall be available at all times in areas where demolition work is being performed using burning torches. Burning of demolition debris shall not be permitted on or near the site.
- C The Contractor shall furnish signs, lights, barricades and other equipment as may be necessary for the safe prosecution of his/her work. All protection shall be removed when demolition work is completed.

1.08 DAMAGE

- A Promptly repair damage caused to adjacent facilities by demolition operations as directed by the Engineer and at no cost to the Owner. Repairs shall be made to a condition equal or better than that which existed prior to construction.

1.09 UTILITIES

- A Maintain existing utilities in service and protect against damage during demolition operations.
- B Do not interrupt existing utilities serving occupied or used facilities, except when authorized by the Engineer. Provide temporary services acceptable to the Engineer during interruptions to existing utilities. Temporary services must be in operation prior to removal of existing services to be demolished. Remove temporary utilities at completion of new work.
- C The Contractor shall cooperate with the Owner in shutting off utilities serving structures of the existing facilities as required for the performance of demolition operations.
- D The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all utilities or services under the jurisdiction of the public and private utility companies.
- E All utilities being abandoned shall be disconnected and terminated at the service mains in conformance with the requirements of the utility companies or the municipality owning or controlling them.

1.10 DUST AND NOISE CONTROL

- A The Contractor shall take all measures necessary to minimize the amount of dust and noise resulting from demolition activity.

PART 2: PRODUCTS

2.01 MATERIALS

- A All materials or items of equipment required for the performance of the work of this Section shall be suitable for the intended purpose and shall be equal, where applicable, to similar items and materials specified in other Sections of the Specifications.

PART 3: EXECUTION

3.01 SEQUENCE OF WORK

- A The sequence of demolition and, where applicable, modifications to existing facilities shall be in accordance with Section 01311, 01750 and the schedule submitted in accordance with Paragraph 1.03 above.

3.02 REMOVAL OF EXISTING PROCESS EQUIPMENT, PIPING AND APPURTENANCES

- A Mechanical removals shall consist of dismantling and removing of existing piping, pumps, motors, equipment and other appurtenances as specified, shown, or required for the completion of the work. It shall include cutting, capping, and plugging as required, except that the cutting of existing piping for the purpose of making connection thereto will be included under Division 15.
- B Existing process, water, chemical, gas, and other piping not required for the new work shall be removed where shown or where it will interfere with new work shall be removed to the nearest solid support, capped and left in place. Where piping that is to be removed passes through existing walls, it shall be cut off and properly capped on each side of the wall.

3.03 DEMOLITION

- A Demolition shall be performed to the limits shown on the Drawings or, if no limits are shown, to a depth at least 2-ft below existing and proposed final grades, or 2-ft below any new foundation or pipe.
- B Wet down work during demolition operations to prevent dust from arising. Provide protection from inclement weather for materials, equipment and personnel located in partially dismantled structures.
- C Existing, below grade slabs and structures to be abandoned but not demolished shall have holes cut to allow for positive drainage to prevent flotation and shall be filled with granular fill.
- D Remove all existing work as indicated on the Drawings or as required and prepare adjoining areas for installation of the new work or for blocking up and filling in of existing openings.
- E All demolition debris shall become the property of the Contractor and shall be removed from the site and disposed of off site by the Contractor, in conformance with all applicable laws and regulations. Demolition debris shall not be used for fill or backfill.
- F Blasting or the use of explosives will not be allowed for demolition work.
- G Contractor shall remove from the site all debris resulting from the demolition operations as it accumulates. Upon completion of the work, all materials, equipment, waste and debris of every sort shall be removed and the premises shall be left clean, neat and orderly.

END OF SECTION

SECTION 03600
GROUT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install grout complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Demolition is included in Section 02050.
- B. Modifications to existing concrete are included in Section 03740.
- C. Miscellaneous metals are included in Section 05500.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of surface preparation, mixing and installation for:
 - 1. Commercially manufactured non-shrink cementitious grout. Include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to the specified ASTM standards, and Material Safety Data Sheet.
 - 2. Commercially manufactured non-shrink epoxy grout. Include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to the specified ASTM standards, and Material Safety Data Sheet.
- B. Samples
 - 1. Submit samples of commercially manufactured grout products when requested by the Engineer.
- C. Qualifications
 - 1. Submit documentation that grout manufacturers have a minimum of at least 10 years experience in the production and use of the grouts proposed.

1.04 REFERENCE STANDARDS

- A. ASTM International
 - 1. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts and Monolithic Surfacing and Polymer Concretes
 - 2. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concretes

3. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
4. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
5. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
6. ASTM E329 - Standard specification for agencies engaged in the testing and/or inspection of materials used in construction

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Grout manufacturers shall have a minimum of 10 years experience in the production and use of the type of grout proposed.

B. Pre-installation Meeting

1. At least ten working days before grouting, hold a pre-installation meeting to review the requirements for surface preparation, mixing, placing and curing procedures for each product proposed for use. Notify all parties involved with grouting, including the Engineer, of the meeting at least ten working days prior to its scheduled date.

C. Services of Manufacturer's Representative

1. Provide services of a field technician of the epoxy grout manufacturer who has performed at least five projects of similar size and complexity during the last five years, to attend the pre-installation meeting, to be present for the initial installation of each type of non-shrink grout, and to correct installation problems.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions.
- B. Store materials in full compliance with the manufacturer's recommendations. Limit total storage time from date of manufacture to date of installation to six months or the manufacturer's recommended storage time, whichever is less.
- C. Remove immediately from the site material which becomes damp, contains lumps, or is hardened and replace with acceptable material at no additional cost to the Owner.
- D. Deliver non-shrink cementitious grout as a pre-portioned blend in prepackaged mixes requiring only the addition of water.

- E. Deliver non-shrink epoxy grout as a pre-proportioned, prepackaged, three component system requiring only mixing as directed by the manufacturer.

1.07 DEFINITIONS

- A. Non-shrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state and bonds to a clean base plate.

PART 2 PRODUCTS

2.01 GENERAL

- A. The use of a manufacturer's name and product or catalog number is for the purpose of establishing the standard of quality desired.
- B. Like materials shall be the products of one manufacturer or supplier in order to provide standardization of appearance.

2.02 MATERIALS

- A. Non-shrink Cementitious Grout

- 1. Non-shrink cementitious grouts: Conform to ASTM C1107. Grouts shall be portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents and require only the addition of water. Non-shrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.
 - a. General purpose non-shrink cementitious grout: Conform to the standards stated above. SikaGrout 212 by Sika Corp.; Set Grout by BASF Building Systems; NS Grout by The Euclid Chemical Co.; Five Star Grout by Five Star Products, Inc., or equal.
 - b. Flowable (Precision) non-shrink cementitious grout: Conform to the standards stated above. Masterflow 928 by BASF Building Systems; Hi-Flow Grout by The Euclid Chemical Co.; SikaGrout 212 by Sika Corp.; Five Star Grout by Five Star Products, Inc., or equal.

- B. Non-shrink Epoxy Grout

- 1. Non-shrink epoxy grout: Grout shall be pre-proportioned, prepackaged, three component, 100 percent solids system consisting of epoxy resin, hardener and blended aggregate. It shall have a compressive strength of 10,000 psi in 7 days when tested in conformity with ASTM C579 and have a maximum coefficient of thermal expansion of 30×10^{-6} in/in/degrees F when tested in conformity with ASTM C531. The maximum exotherm shall be 100 degrees Fahrenheit.
- 2. 5 Star DP Epoxy Grout PG by 5 Star Grout, Escoweld 7505E/7530 by ITW Polymers Coatings North America; Masterflow 649 by BASF Building Systems; E3-G Epoxy Grout by the Euclid Chemical Co; Sealtight EG-96 HP by WR Meadows, Inc.

- C. Water

1. Potable water free of oil, acid, alkali, salts, chlorides (except those attributable to drinking water), organic matter, or other deleterious substances.

PART 3 EXECUTION

3.01 PREPARATION

- A. Place grout where indicated or specified over existing concrete and cured concrete which has attained its specified design strength unless otherwise approved by the Engineer.
- B. Concrete surfaces to receive grout shall be clean and sound; free of ice, frost, dirt, dust, grease, oil, form release agent, laitance and paints and free of all loose material or foreign matter which may affect the bond or performance of the grout.
- C. Roughen concrete surfaces by chipping, sandblasting, or other dry mechanical means to bond the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance and firmly embedded into the parent concrete.
 1. Air compressors used to clean surfaces in contact with grout shall be the oilless type or equipped with an oil trap in the airline to prevent oil from being blown onto the surface.
- D. Remove all loose rust, oil or other deleterious substances which may affect the bond or performance of the grout from metal embedments or bottom of baseplates prior to the installation of the grout.
- E. Non-shrink epoxy grouts do not require saturation of the concrete substrate. Do not wet concrete surfaces to receive non-shrink epoxy grout. Surfaces in contact with epoxy grout shall be completely dry before grouting.
- F. Provide forms for grout. Line or coat forms with release agents recommended by the grout manufacturer. Provide forms anchored in place and shored to resist the forces imposed by the grout and its placement.
 1. Forms for all grout shall be designed to allow the formation of a hydraulic head and shall have chamfer strips built into forms.
- G. Level and align the equipment bearing plates in accordance with the recommendations of the equipment manufacturer.
- H. Support equipment during alignment and installation of grout by shims, wedges, blocks or other approved means. The shims, wedges and blocking devices shall be prevented from bonding to the grout by bond breaking coatings and removed after grouting unless otherwise approved by the Engineer. Grout voids created by the removal of shims, wedges and blocks.

3.02 INSTALLATION - GENERAL

- A. Mix, apply and cure products in strict compliance with the manufacturer's recommendations and these specifications.

- B. Provide staffing and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.
- C. Maintain temperatures of the base plate, supporting concrete, and grout between 40 and 90 degrees F during grouting and for at least 24 hours after placement, until grout compressive strength reaches 1000 psi or as recommended by the grout manufacturer, whichever is longer. Do not allow differential heating or cooling of baseplates and grout during the curing period.
- D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with the grout are outside of the 40 to 90 degrees F range.
- E. Install grout to preserve the isolation between the elements on either side of the joint where grout is placed in the vicinity of an expansion or control joint.
- F. Reflect all existing underlying expansion, control and construction joints through the grout.

3.03 INSTALLATION - NON-SHRINK CEMENTITIOUS GROUTS

- A. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel or admixtures without prior approval by the Engineer.
- B. Do not mix by hand. Mix in a mortar mixer with moving blades. Pre-wet the mixer and empty excess water. Add pre-measured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.
- C. Placements greater than 3-in in depth shall include the addition of clean, washed pea gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.
- D. Provide forms as specified in Paragraph 3.01E. Place grout into the designated areas and prevent segregation and entrapment of air. Do not vibrate grout to release air or to consolidate the material. Fill all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes and vent holes as necessary.
- E. Place grout rapidly and continuously to avoid cold joints. Do not place grout in layers. Do not add additional water to the mix (retemper) after initial stiffening.
- F. Just before the grout reaches its final set, cut back the grout to the substrate at a 45 degree angle from the lower edge of bearing plate unless otherwise ordered and approved by the Engineer. Finish this surface with a wood float or brush finish.
- G. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement, until grout compressive strength reaches 1000 psi or as recommended by the manufacturer, whichever is longer. Saturate the grout surface by use of saturated burlap bags, soaker hoses or ponding. Provide sunshades.

3.04 INSTALLATION – NON-SHRINK EPOXY GROUTS

- A. Mix in accordance with manufacturer's recommendations. Mix full batches only, to maintain proper proportions of resin, hardener and aggregate. Do not vary the ratio of components or add solvent to change the consistency of the grout mix. Do not overmix. Do not entrain air bubbles by mixing too quickly.
- B. Monitor ambient weather conditions and contact the grout manufacturer for special placement procedures to be used for temperatures below 60 or above 90 degrees F.
- C. Place grout rapidly and continuously to avoid cold joints. Place grout in lifts in accordance with manufacturer's recommendations.
- D. Provide forms as specified in Paragraph 3.01G. Place grout into the designated areas and prevent entrapment of air. Fill all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes and vent holes as necessary.
- E. Minimize "shoulder" length (extension of grout horizontally beyond base plate). In no case shall the shoulder length of the grout be greater than the grout thickness.
- F. Finish grout by puddling to cover all aggregate and provide a smooth finish. Break bubbles and smooth the top surface of the grout in conformity with the manufacturer's recommendations.

3.05 SCHEDULE

- A. The following list indicates where the particular types of grout are to be used:
 - 1. General purpose non-shrink cementitious grout: Use at all locations where non-shrink grout is indicated on the Drawings, except for base plates greater in area than 3-ft wide by 3-ft long.
 - 2. Non-shrink epoxy grout: Use at all locations specifically indicated on the Drawings to receive non-shrink epoxy grout.

END OF SECTION

SECTION 03740
MODIFICATIONS TO EXISTING CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, apparatus, scaffolding, protection, testing, monitoring, disposal and incidentals required to cut, or otherwise modify parts of existing concrete structures or appurtenances as shown on the Drawings and as specified herein.
- B. No existing structure or concrete shall be shifted, cut, removed, or otherwise altered until authorization is given by the Engineer.

1.02 RELATED WORK

- A. Demolition and modifications are included in Section 02050.
- B. Miscellaneous metals are included in Section 05500.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, manufacturer's technical literature on all products. Include in the submittal the manufacturer's installation and/or application instructions.
- B. Submit documentation of the qualifications as specified in paragraphs 1.05 D and paragraph 1.05 E.
- C. Certifications
 - 1. Certify that the Contractor is not associated with the independent testing laboratory proposed for use by the Contractor nor does the Contractor or officers of the Contractor's organization have a beneficial interest in the laboratory.
- D. Qualifications
 - 1. Independent Testing Laboratory
 - a. Name and address
 - b. Names and positions of principal officers and the name, position, and qualifications of the responsible registered professional engineer in charge.
 - c. Listing of technical services to be provided. Indicate external technical services to be provided by other organizations.
 - d. Names and qualifications of the supervising laboratory technicians.
 - e. Statement of conformance provided by evaluation authority defined in ASTM C1077. Provide report prepared by evaluation authority when requested by the Engineer.
 - f. Submit as required above for other organizations that will provide external technical services.
- E. Submit for adhesive anchoring system, manufacturer's ICC ESR report for anchorage to cracked concrete.

1.04 REFERENCE STANDARDS

A. ASTM International

1. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
 2. ASTM C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
 3. ASTM C883 - Standard Test Method for Effective Shrinkage of Epoxy-Resin Systems Used with Concrete.
 4. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
 5. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
 6. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
 7. ASTM D732 - Standard Test Method for Shear Strength of Plastics by Punch Tool.
 8. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 9. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 10. ASTM C1218-Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
 11. ASTM C856 - Standard Practice for Petrographic Examination of Hardened Concrete
- B. Where reference is made to the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. No existing structure or concrete shall be shifted, cut, removed, or otherwise altered until authorization is given by the Engineer.
- B. When removing materials or portions of existing structures and when making openings in existing structures, all precautions shall be taken and all necessary barriers, shoring and bracing and other protective devices shall be erected to prevent damage to the structures beyond the limits necessary for the new work, protect personnel, control dust and to prevent damage to the structures or contents by falling or flying debris. Unless otherwise permitted, shown or specified, line drilling will be required in cutting existing concrete.
- C. Unless otherwise indicated or specified, cut existing concrete by line drilling.
- D. Manufacturer qualifications. Have a minimum of ten years experience within the last ten years in the manufacture and use of the products specified and have an ongoing program of training, and technically supporting the Contractor's personnel.

- E. Contractor qualifications. The concrete contractor or subcontractor shall be an experienced concrete modification contractor who for the past ten years has been engaged in concrete modification work and has successfully completed five projects during that time that are similar in nature to the work required for this project.
- F. The Contractor is ultimately responsible for the workmanship and quality of the concrete modification. Inspections by the Engineers or others do not limit the Contractor or subcontractor's responsibility. Quality Assurance is the responsibility of the Contractor and all other subcontractors.
- G. A representative of the product manufacturer shall be present for the first three days of installation to give instructions to the installation crew.
- H. In the event of a conflict between these specifications and the manufacturer's instructions, the more stringent requirements shall apply.
- I. If any requirements of this specification are contradicted by the referenced standards, the matter shall be resolved in writing by the Engineer or its representative.
- J. Source of Materials: Obtain materials for concrete modifications from a single source for each type of material used to ensure consistency of quality, color, pattern, texture, and finish. Furnish a certificate stating that the materials to be provided meet the requirements of this Section and the manufacturer's current printed literature on the specified product.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:

- 1. Deliver all materials in original, new and unopened packages and containers clearly labeled with the following information:
 - a. Manufacturer's name.
 - b. Name or title of material, and other product identification.
 - c. Manufacturer's stock number and batch number.
 - d. Date of manufacture.
 - e. Instructions.
 - f. Expiration or "use by" date.

B. Storage of Materials:

- 1. Store the products in accordance with the manufacturers' recommendations, and supplementary requirements below.
- 2. Store only approved materials on site.
- 3. Store in a suitable location approved by Engineer. Keep area clean and accessible.
- 4. Comply with health and fire regulations including the requirements of the Occupational Safety and Health Administration (OSHA).

C. Handling of Materials:

1. Handle the products in accordance with the manufacturers' recommendations, and supplementary requirements below.
2. Handle materials carefully to prevent inclusion of foreign materials.
3. Do not open containers or mix components until necessary preparatory work has been completed and application work will start immediately.

PART 2 PRODUCTS

2.01 GENERAL

1. Materials shall comply with this Section and any Federal, State or local VOC limitations.

2.02 CONCRETE REPAIR MATERIALS

A. Epoxy Bonding Agent

1. General
 - a. The epoxy bonding agent shall be a two-component, solvent-free, asbestos-free moisture insensitive epoxy resin material used to bond plastic concrete to hardened concrete and complying with the requirements of ASTM C881, Type II and the additional requirements specified herein.
2. Material
 - a. Properties of the cured material:
 - 1) Compressive Strength (ASTM D695): 12,200 psi minimum at 28 days.
 - 2) Tensile Strength (ASTM D638): 6900 psi minimum at 7 days.
 - 3) Flexural Strength (ASTM D790 - Modulus of Rupture): 7,000 psi minimum at 14 days.
 - 4) Shear Strength (ASTM D732): 6200 psi minimum at 14 days.
 - 5) Water Absorption (ASTM D570): 0.21 percent maximum at 7 days.
 - 6) Bond Strength (ASTM C882) Hardened to Plastic: 2200 psi minimum at 14 days moist cure.
 - 7) Effective Shrinkage (ASTM C883): Passes Test.
 - 8) Color: Gray.
3. Approved Manufacturer
 - a. Sika Corporation, Lyndhurst, NJ – Sikadur 32, Hi-Mod or equal.

B. Repair Mortar (Polymer-Modified Portland Cement Mortar)

1. Horizontal Surfaces
 - a. Polymer-modified, portland cement, fast setting, non-sag mortar is a two-component material with a migrating corrosion inhibitor used to repair horizontal concrete surfaces.
 - b. Properties of the cured material:
 - 1) Compressive Strength (ASTM C109): 7000 psi minimum at 28 days.
 - 2) Splitting Tensile Strength (ASTM C496): 900 psi minimum at 28 days.
 - 3) Flexural Strength (ASTM C293): 2000 psi minimum at 28 days.
 - 4) Freeze/Thaw Resistance (ASTM C666): 200 cycles @ 98 percent.

- 5) Bond Strength (ASTM C882 Modified) Hardened to Plastic: 2200 psi minimum at 28 days moist cure.
 - 6) Permeability (AASHTO T277): 500 coulombs @ 28 days
 - 7) Color: Gray
 - c. Approved manufacturer's include: Sika Corporation, Lyndhurst, NJ – SikaTop 122 Plus or equal.
2. Vertical and Overhead Surfaces
- a. Repair mortar is a two-component polymer-modified, portland cement, fast setting, non-sag mortar used to repair vertical and overhead surfaces with a migrating corrosion inhibitor.
 - b. Material
 - 1) Properties of the cured material:
 - a) Compressive Strength (ASTM C109): 7000 psi minimum at 28 days.
 - b) Splitting Tensile Strength (ASTM C496): 900 psi minimum at 28 days.
 - c) Flexural Strength (ASTM C293): 2000 psi minimum at 28 days.
 - d) Freeze/Thaw Resistance (ASTM C666): 300 cycles at 98 percent.
 - e) Bond Strength (ASTM C882 Modified) Hardened to Plastic: 2200 psi minimum at 28 days moist cure.
 - f) Permeability (AASHTO T277): 500 coulombs at 28 days.
 - g) Color: Gray.
 - c. Approved manufacturer's include: Sika Corporation, Lyndhurst, NJ - SikaTop 123 Plus or equal.

C. Adhesive Anchoring System

1. Provide an adhesive anchor system utilizing an injection adhesive material used for the installation of drilled-in reinforcing steel dowels where indicated on the Drawings.
2. Injection Adhesive Material
 - a. Injection adhesive material shall be a two-component system which includes a hardener and a resin, furnished in pre-measured side-by-side cartridges which keep the two components separate. Side-by-side cartridges shall be designed to accept a static mixing nozzle which thoroughly blends the two components and allows injection directly into the drilled hole.
3. Adhesive anchor system shall be Hilti HIT-RE 500-SD Adhesive Anchor System; Simpson Strong-Tie SET-XP Adhesive Anchor System; ITW Red Head Epcon G5 Adhesive Anchor System; or equal. Adhesive anchors are designed based on Hilti HIT-RE 500-SD, unless otherwise noted.

PART 3 EXECUTION

3.01 GENERAL

- A. Do not use or retain contaminated, outdated, or diluted materials. Do not use materials from previously open containers.
- B. Cut, repair, remove, and modify parts of the existing structures as indicated and specified. Finishes, joints, and reinforcements are specified in their respective sections. All work shall comply with the requirements of this Section and as indicated.

- C. All commercial products shall be stored, mixed and applied in strict compliance with the manufacturer's recommendations and as specified in Paragraph 1.06.
- D. When drilling holes for dowels/bolts, stop drilling if reinforcing is encountered. As approved by the Engineer, relocate the hole to avoid reinforcing. Do not cut reinforcing without prior approval by the Engineer. Where possible, identify reinforcing locations prior to drilling using "rebar locators" so that drill hole locations may be adjusted to avoid reinforcing interference.
- E. Inspection:
 - 1. Inspect ambient conditions during various material installation phases for conformance with the specified requirements.
 - 2. Inspect concrete substrates to which various repair materials are to be applied for conformance with the specified application criteria including but not limited to substrate profile, degree of cleanliness, and dryness.
- F. Strictly follow the material manufacturer's application recommendations during the entire application process.
- G. The Engineer may from time to time direct the Contractor to make additional repairs to existing concrete. These repairs shall be made as specified or by such other methods as may be appropriate.

3.02 CONCRETE REMOVAL

- A. Concrete designated to be removed to specific limits as shown on the Drawings or directed by the Engineer, shall be done by line drilling at limits of removal followed by chipping or jack- hammering as appropriate in areas where concrete is to be taken out. Remove concrete in such a manner that surrounding concrete and existing reinforcing to be left in place and existing in place equipment are not damaged. Sawcutting at limits of concrete to be removed shall only be done if indicated on the Drawings, specified herein, or after obtaining written approval from the Engineer.
- B. Where the joint between new concrete or repair mortar and existing concrete will be exposed in the finished work, the edge of concrete removal shall be a 3/4-in deep sawcut on each exposed surface of the existing concrete except as otherwise indicated or specified.
- C. Repair or replace concrete specified to be left in place which is damaged during concrete modifications as directed by the Engineer at no additional cost to the Owner.

3.03 CONNECTION SURFACE PREPARATION

- A. Connection surfaces shall be prepared as specified below for concrete areas requiring patching, repairs or modifications as shown on the Drawings, specified, or as directed by the Engineer.
- B. Remove all loose and deteriorated materials, efflorescence, existing repair materials (sealants, adhesives, epoxies, etc.) dirt, oil, grease, and all other bond inhibiting materials from the surface by dry mechanical means, i.e. - sandblasting, chipping, wire brushing, or other mechanical means as approved by the Engineer. Uniformly roughen the concrete surface to approximately 1/4-in amplitude with pointed chipping tools. Thoroughly clean surface of loose or weakened

material by sandblasting or airblasting. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into parent concrete.

- C. If reinforcing steel is exposed, it must be mechanically cleaned to remove all loose material, contaminants, rust, etc, as approved by the Engineer. If half of the diameter of the reinforcing steel is exposed, chip out behind the steel. The distance chipped behind the steel shall be a minimum of 1-in. Reinforcing to be incorporated in new concrete and/or repair mortar shall not be damaged during the removal operation.
- D. Reinforcing from existing removed or deteriorated concrete which is shown to be incorporated in new concrete and/or repair mortar shall be cleaned by mechanical means to remove all loose material and products of corrosion before proceeding. It shall be cut, bent or lapped to new reinforcing as shown on the Drawings and provided with one inch minimum cover all around.
- E. The following are specific concrete surface preparation "methods" to be used where called for on the Drawings, specified or as directed by the Engineer.
 - 1. Method A - After the existing concrete surface at connection has been roughened and cleaned, thoroughly saturate with water with no standing water during application. Repair mortar must be scrubbed into substrate filling all pores and voids. While the scrub coat is still plastic, force repair material against surface. If area is too large, an epoxy bonding agent may be used. Place new repair mortar as detailed on Drawings. Field preparation and application shall comply strictly with manufacturer's recommendations.
 - 2. Method B - After the existing concrete surface has been roughened and cleaned, apply epoxy bonding agent at connection surface. The field preparation and application of the epoxy bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or repair mortar to limits shown on the Drawings within time constraints recommended by the manufacturer to ensure bond.
 - 3. Method C – Adhesive anchoring system shall be used for installation of all reinforcing steel dowels into existing concrete where indicated on Drawings. The installation shall comply strictly with manufacturer's recommendations, including drill bit diameter, surface preparation, injection and installation of dowel. Use oil free compressed air to blast out loose particles and dust from the drilled holes. Dowels must be clean and free of dirt, oil, grease, ice or other material which would reduce bond. Deformed bars shall be drilled and embedded to the depth indicated on the Drawings.

3.04 REPAIR MORTAR PLACEMENT AND FINISHING

- A. Follow the procedures recommended by the manufacturer for the mixing and placement of the repair mortar.
- B. After the initial mixing of the repair mortar, additional water shall not be added to change the consistency should the mix begin to stiffen.
- C. Substrate shall be saturated surface dry (SSD) with no standing water during application.
- D. Apply scrub coat to substrate, filling all pores and voids.

- E. While scrub coat is still plastic, apply the polymer-modified repair mortar. The repair mortar shall be placed to an even, uniform plane to restore the member to its original surface.
- F. For applications greater than 1-in in depth, apply repair mortar in lifts. Score the exposed surface of each lift to produce a roughened surface before applying the next lift. Allow the lift to reach final set before proceeding with the next lift.
- G. The repair mortar shall receive a smooth, steel trowel finish, unless otherwise noted.
- H. When completed, there shall be no sharp edges. All exterior corners, such as at penetrations, shall be made with a one-inch radius. All interior corners shall be square.
- I. Curing shall be performed as recommended by the repair mortar manufacturer except that the cure period shall be at least 24 hours and shall be by means of a continuous fog spray or moist cure with wet burlap.

3.05 FINAL INSPECTION

- A. Perform final inspection to determine whether the concrete modifications meet the requirements of the specification. The Engineer will subsequently conduct a final inspection for conformance to the contract documents.
- B. Upon completion of the concrete modification for any given area, the surfaces shall be cleaned and prepared to permit close visual inspection by the Engineer. Any and all deficiencies or defective work (not in compliance with this section or related sections) will be marked by the Engineer for repairs or removal/replacement by the Contractor at no additional cost to the Owner.
- C. Mark any rework required. Such areas shall be repaired as specified at no additional cost to the Owner.

3.06 CLEAN-UP AND WASTE

- A. Clean-up: During progress of the work, remove from site discarded sealant materials, rubbish, cans and rags at the end of each work day.
- B. Disposal of all waste materials shall be the Contractor's responsibility.
- C. At the completion of the concrete modification work, remove all equipment, scaffolding, surplus material, spent abrasive blast material and debris from the site.

END OF SECTION

SECTION 05500

MISCELLANEOUS METAL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install all miscellaneous metal complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Pipe hangers and sleeves are included in Division 15.
- B. Equipment anchor bolts are included in the respective Sections of Divisions 11, 15 and 16.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings and product data showing materials of construction and details of installation for:
 - 1. Shop drawings, showing sizes of members, method of assembly, anchorage and connection to other members.
- B. Samples
 - 1. Submit samples as requested by the Engineer during the course of construction.
- C. Test Reports
 - 1. Certified copy of mill test reports on each steel, stainless steel, or aluminum proposed for use showing the physical properties and chemical analysis.
- D. Certificates
 - 1. Certify that welders have been qualified under AWS, within the previous 12 months, to perform the welds required under this Section.

1.04 REFERENCE STANDARDS

- A. Aluminum Association (AA)
 - 1. AA M31C22A41
 - a. M31: Mechanical Finish, Fine Satin
 - b. C22: Finish, Medium Matte
 - c. A41: Clear Anodic Coating, Class I
- B. ASTM International
 - 1. ASTM A36 - Standard Specification for Carbon Structural Steel.

2. ASTM A48 - Standard Specification for Gray Iron Castings.
3. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
4. ASTM A108 - Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
5. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
6. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
7. ASTM A240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Plate, Sheet, and Strip Pressure Vessels.
8. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.
9. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 Psi Tensile Strength.
10. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
11. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
12. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
13. ASTM A536 - Standard Specification for Ductile Iron Castings.
14. ASTM A570 - Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
15. ASTM A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
16. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
17. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
18. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
19. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

20. ASTM F2329 - Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon Screws, Washers, Nuts, and Special Threaded Fasteners

C. American Institute of Steel Construction (AISC)

1. Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design.

D. American Welding Society (AWS)

1. AWS D1.1 - Structural Welding Code - Steel.

2. AWS D1.2 - Structural Welding Code - Aluminum.

3. AWS D1.6 - Structural Welding Code - Stainless Steel

E. Federal Specifications

1. FS-FF-B-575C - Bolts, Hexagonal and Square

F. Occupational Safety and Health Administration (OSHA)

G. International Building Code, NJ Edition, 2009

H. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. The work of this Section shall be completely coordinated with the work of other Sections. Verify, at the site, both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

C. All welding shall be performed by qualified welders and shall conform to the applicable AWS welding code. Welding of steel shall conform to AWS D1.1 and welding of aluminum shall conform to AWS D1.2 and welding of stainless steel shall conform to AWS D1.6.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation.

B. Store materials on skids and not on the ground and block up so that they will not become bent or otherwise damaged. Handle materials with cranes or derricks. Do not dump material off cars or trucks nor handle in any other way that will cause damage.

C. Repair items that have become damaged or corroded to the satisfaction of the Engineer prior to incorporating them into the work.

1.07 PROJECT/SITE REQUIREMENTS

- A. Field measurements shall be taken at the site, prior to fabrication of items, to verify or supplement indicated dimensions and to ensure proper fitting of all items.

PART 2 PRODUCTS

2.01 GENERAL

- A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance and manufacturer's service.

2.02 MATERIALS

- A. Unless otherwise noted, materials for miscellaneous metals shall conform to the following standards:
 - 1. Structural Steel Wide flange shapes: ASTM A992
 - 2. Other steel shapes; plates; rods and bars: ASTM A36
 - 3. Structural Steel Tubing ASTM A500, Grade C
 - 4. Welded and Seamless Steel Pipe ASTM A501 or ASTM A53, Type E or S, Grade B Schedule 40. Use standard malleable iron fittings, galvanized for exterior work
 - 5. Steel Sheets ASTM A1008
 - 6. Gray Iron Castings ASTM A48, Class 35
 - 7. Ductile Iron Castings ASTM A536, Grade 65-45-12
 - 8. Aluminum Extruded Pipe ASTM B429, Alloy 6063 T6 and Alloy 6061 T6 as indicated
 - 9. Aluminum Extruded Shapes ASTM B221, Alloy 6061 T6
 - 10. Aluminum Sheet and Plate ASTM B209, Alloy 6061 T6
 - 11. Stainless Steel Plates, Sheets, and Structural Shapes
 - a. Exterior, Submerged or Industrial Use ASTM A240, Type 316 (Type 316L for welded)
 - b. Interior and Architectural Use ASTM A240, Type 304
 - 12. Stainless Steel Bolts, Nuts, and Washers ASTM A276, Type 316

- | | |
|---|--|
| 13. Carbon Steel Bolts and Studs | ASTM A307, Grade A (hot dip galvanized nuts and washers where noted) |
| 14. High Strength Steel Bolts, Nuts and washers | ASTM A325 (mechanically galvanized per ASTM B695, Class 50, where noted) |
| a. Elevated Temperature Exposure | Type I |
| b. General Application | Type I or Type II |
| 15. Galvanizing | ASTM A123, Zn w/0.05 percent minimum Ni |
| 16. Galvanizing, hardware | ASTM A153, Zn w/0.05 percent minimum Ni |
| 17. Galvanizing, anchor bolts | ASTM F2329, Zn w/0.05 percent minimum Ni |
| 18. Welding electrodes, steel | AWS A5.1 E70xx |

2.03 ANCHORS, BOLTS AND FASTENING DEVICES

- A. Unless otherwise noted, anchor bolts shall be ASTM F1554, Grade 36. Provide standard headed bolts with heavy hex nuts and Grade A washers, all galvanized in accordance with ASTM F2329.
- B. Unless otherwise noted, bolts for the connection of carbon steel or iron shall be steel machine bolts; bolts for the connection of galvanized steel or iron shall be galvanized steel or stainless steel machine bolts; and bolts for the connection of aluminum or stainless steel shall be stainless steel machine bolts.
- C. Unless otherwise noted, expansion anchors shall be zinc plated carbon steel wedge type anchors complete with nuts and washers. Type 316 stainless steel wedge type anchors shall be used where they will be submerged or exposed to the weather or where stainless steel wedge type anchors are shown or specified. When the length or embedment of the bolt is not noted on the Drawings, provide length sufficient to place the wedge and expansion cone portion of the bolt at least 1-in behind the concrete reinforcing steel. Expansion anchors shall be Hilti, Kwik-Bolt III; Simpson Strong-Tie Wedge-All, or equal.
- D. Compound masonry expansion anchors shall be lead expansion sleeve type anchors complete with nuts and washers. Anchors shall be precision die-cast zinc alloy with a minimum of two lead alloy expansion sleeves. When the length or embedment of the bolt is not noted on the Drawings, provide length sufficient to place the wedge and expansion sleeve portion of the bolt at least 1-in behind the concrete reinforcing steel. Expansion anchors shall be Star Expansion Industries, Star Slugin or equal.
- E. Adhesive anchor system, for fastening to solid concrete substrate, shall be a system manufactured for the installation of post installed studs including anchoring hardware and chemical dispenser. Injection adhesive shall be a two-component epoxy system including a hardener and a resin, furnished in pre-measured side-by-side cartridges which keep the two components separate. Side-by-side cartridges shall be designed to accept a static mixing nozzle which thoroughly blends the two components and allows injection directly into the drilled hole.

Provide zinc plated carbon steel or Type 316 stainless steel stud assemblies as indicated on the Drawings consisting of an all-thread anchor rod with nut and washer. Adhesive anchor system shall be Hilti RE 500 SD; Simpson Strong Tie SET-XP; ITW Ramset Red Head Epcon G5; or equal. Unless otherwise noted, anchorage designs shown on the Drawings are based on Hilti RE 500 SD.

- F. Adhesive anchors, for fastening to hollow concrete block or brick, or hollow-core precast concrete planks shall be a three-part stud, screen tube and chemical dispenser anchoring system. Adhesive cartridges shall contain pre-measured amounts of resin and hardener which are mixed and deposited in a screen tube by a dispenser. Provide zinc plated carbon steel or Type 316 stainless steel stud assemblies as indicated on the Drawings consisting of an all-thread anchor rod with nut and washer. Anchors shall be Hilti HIT HY-70 System; Rawlplug Company Chem-Fast; ITW Ramset Redhead Ceramic 6 Epcon System, or equal.
- G. Machine bolts and nuts shall conform to Federal Specification FF-B-575C. Bolts and nuts shall be hexagon type. Bolts, nuts, screws, washers and related appurtenances shall be Type 316 stainless steel.
- H. Toggle bolts shall be Hilti, Toggler Bolt or equal.

2.04 MISCELLANEOUS ALUMINUM

- A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Holes shall be drilled or punched. Edges shall be smooth and without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.
- B. Connections and accessories shall be of sufficient strength to safely withstand the stresses and strains to which they will be subjected. Exposed joints shall be close fitting and jointed where least conspicuous. Threaded connections shall have the threads concealed where practical. Welded connections shall have continuous welds or intermittent welds as specified or shown. The face of welds shall be dressed flush and smooth. Welding shall be on the unexposed side as much as possible in order to prevent pitting or discoloration of the aluminum exposed surface. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.
- C. Miscellaneous aluminum items shall include: beams, angles, closure angles and any other miscellaneous aluminum called for on the Drawings and not otherwise specified.

2.05 MISCELLANEOUS STEEL

- A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Holes shall be drilled or punched. Edges shall be smooth and without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.
- B. Connections and accessories shall be of sufficient strength to safely withstand the stresses and strains to which they will be subjected. Exposed joints shall be close fitting and jointed where least conspicuous. Threaded connections shall have the threads concealed where practical.

Welded connections shall have continuous welds or intermittent welds as specified or shown. The face of welds shall be dressed flush and smooth. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.

- C. Miscellaneous steel items shall include: beams, angles and any other miscellaneous steel called for on the Drawings and not otherwise specified.
- D. All miscellaneous steel shall be galvanized.
- E. Galvanizing shall be the hot-dip zinc process after fabrication. Coating shall be not less than 2 oz/sq ft of surface.

2.06 MISCELLANEOUS STAINLESS STEEL

- A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Holes shall be drilled or punched. Edges shall be smooth and without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.
- B. Connections and accessories shall be of sufficient strength to safely withstand the stresses and strains to which they will be subjected. Exposed joints shall be close fitting and jointed where least conspicuous. Threaded connections shall have the threads concealed where practical. Welded connections shall have continuous welds or intermittent welds as specified or shown. The face of welds shall be dressed flush and smooth. Grind smooth continuous welds that will be exposed. Provide holes for temporary field connections and for attachment of the work of other trades.
- C. Miscellaneous stainless steel items shall include: beams, angles and any other miscellaneous stainless steel called for on the Drawings and not otherwise specified.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install all items except those to be embedded in concrete which shall be installed under Division 3. Items to be attached to concrete or masonry after such work is completed shall be installed in accordance with the details shown. Fastening to wood plugs in masonry will not be permitted.
- B. Abrasions in the shop primer shall be touched up immediately after erection. Areas left unprimed for welding shall be painted with primer after welding.
- C. Zinc coating which has been burned by welding, abraded, or otherwise damaged shall be cleaned and repaired after installation. The damage area shall be thoroughly cleaned by wire brushing and all traces of welding flux and loose or cracked zinc coating removed prior to painting. The cleaned area shall be painted with two coats of zinc oxide-zinc dust paint conforming to the requirements of Military Specifications MIL-P-15145. The paint shall be properly compounded with a suitable vehicle in the ratio of one part zinc oxide to four parts zinc dust by weight.

- D. Specialty products shall be installed in accordance with the manufacturer's recommendations.
- E. Expansion bolts shall be checked for tightness a minimum of 24 hours after initial installation.
- F. Install adhesive anchor system in strict compliance with the manufacturer's recommendations, including drill bit diameter, surface preparation, temperature, moisture conditions, injection and installation of bolts. Use oil free compressed air to blast out loose particles and dust from the drilled holes. Bolts must be clean and free of dirt, oil, grease, ice or other material which would reduce bond.
- G. All steel surfaces that come into contact with exposed concrete or masonry shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in accordance with the manufacturer's instructions prior to installation.
- H. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc-chromate primer followed by two coats of aluminum metal and masonry paint to the dissimilar metal.
- I. Where aluminum contacts masonry or concrete, apply a heavy coat of approved alkali resistant paint to the masonry or concrete.
- J. Where aluminum contacts wood, apply two coats of aluminum metal and masonry paint to the wood.

END OF SECTION

SECTION 09901

SURFACE PREPARATION AND SHOP PRIME PAINTING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required for the surface preparation and application of shop primers on ferrous metals, excluding stainless steels, as specified herein.

1.02 RELATED WORK

- A. Finish painting is included in Section 09902.

1.03 SUBMITTALS

- A. Submit the following, in accordance with Section 01300.
- B. Shop drawings, manufacturer's specifications and data on the proposed primers and detailed surface preparation, application procedures and dry mil thicknesses.
- C. Submit representative physical samples of the proposed primers, if required by the Engineer.

1.04 REFERENCE STANDARDS

- A. The Society for Protective Coatings (SSPC)
 - 1. SSPC-SP 1 - Solvent Cleaning
 - 2. SSPC-SP 6/NACE No. 3 - Joint Surface Preparation Standard SSPC-SP 6/NACE No. 3: Commercial Blast Cleaning
 - 3. SSPC-SP 10/NACE No. 2 - Joint Surface Preparation Standard SSPC-SP 10/NACE No. 2: Near-White Blast Cleaning.
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Submerged Surfaces - Shop primer for ferrous metals which will be in contact with water being treated, either submerged or which are subject to splash action or which are specified to be considered submerged service shall be shop primed with the following:
 - 1. Shop Prime Coat: (Zinc Micaceous Iron Oxide Polyurethane Aromatic Shop Primer)
 - a. TNEMEC: Series 1 Omnithane
 - b. Carboline: Carboguard 561
 - c. Sherwin-Williams Company (The): Corothane I Galvapac Zinc Primer 1K

- d. PPG PMC Pitt-Guard 97-946 Series Epoxy
 - e. PPG PMC Amercoat 370 Fast Dry Epoxy
 - f. Or equal.
- B. Non-Submerged Surfaces: Shop primer for ferrous metals which will be in contact with water being treated, not submerged and not subject to splash action shall be shop primed with the following :
1. Shop Prime Coat: (Zinc Micaceous Iron Oxide Polyurethane Aromatic Shop Primer)
 - a. TNEMEC: Series 1 Omnithane
 - b. Carboline: Carboguard 561
 - c. Sherwin-Williams Company (The): Corothane I Galvapak Zinc Primer 1K
 - d. PPG PMC MultiPrime Epoxy Fast Dry 94-109 Series
 - e. PPG PMC Amercoat 370 Fast Dry Epoxy
 - f. Or equal.
- C. Submerged Surfaces:
1. Shop Prime Coat for Ductile Iron Pipe: (Epoxy, Polyamidoamine Shop Primer)
 - a. TNEMEC: Series N140 Pota-Pox-Plus
 - b. Carboline: Carboguard 561
 - c. Sherwin-Williams Company (The): Copoxy Shop Primer
 - d. PPG PMC Pitt-Guard 97-946 Series Epoxy
 - e. PPG PMC Amercoat 370 Fast Dry Epoxy
 - f. Or equal.
 2. Shop Prime Coat for Ferrous Metal Surfaces: (Zinc Micaceous Iron Oxide Polyurethane Aromatic Shop Primer)
 - a. TNEMEC: Series 1 Omnithane
 - b. Carboline: Carboguard 561
 - c. Sherwin-Williams Company (The): Corothane I Galvapak Zinc Primer 1K
 - d. PPG PMC MultiPrime Epoxy Fast Dry 94-109 Series
 - e. PPG PMC Amercoat 370 Fast Dry Epoxy
 - f. Or equal.
- D. Non-Primed Surfaces - Gears, bearings surfaces and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintained as necessary to prevent corrosion during all periods of storage and erection and shall be satisfactory to the Engineer up to the time of the final acceptance test.
- E. Compatibility of Coating Systems - Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with their corresponding primers and finish coats specified in Section 09902 for use in the field and which are recommended for use together.

PART 3: EXECUTION

3.01 APPLICATION

A. Surface Preparation and Priming

1. Non-submerged components scheduled for priming, as defined above, shall be blast cleaned in accordance with SSPC-SP 6/NACE No. 3, immediately prior to priming. Submerged components scheduled for priming, as defined above, shall be blast cleaned in accordance with SSPC-SP 10/NACE No. 2, immediately prior to priming. Consult manufacturer regarding required surface profiles.
2. Surfaces shall be dry and free of dust. Solvent clean in accordance with SSPC-SP1 to remove all oil, grease and other foreign material before priming.
3. Shop prime in accordance with approved manufacturer's recommendations.

B. Non-Primed Surfaces

1. Apply approved coating per manufacturer's recommendations.

3.02 FABRICATED ITEMS

- A. All items to be shop primed shall be blast cleaned as specified for applicable service prior to priming. If, in the opinion of the Engineer, any prime coating that has been improperly applied or if material contrary to this Section has been used, that coating shall be removed by abrasive blasting to white metal and reprimed in accordance with this Section.
- B. All shop prime coats shall be of the correct materials and applied in accordance with this Section. Remove any prime coats not in accordance with this Section by blast cleaning and apply the specified prime coat at no additional cost to the Owner.
- C. Shop primed surfaces shall be cleaned thoroughly and damaged or bare spots prepared as approved and retouched with the specified primer before the application of successive paint coats in the field.
- D. Shop finish coats, if proposed and allowed, shall be equal in appearance and protection quality to a field applied finish coat. If, in the opinion of the Engineer, a shop finish coat system does not give the appearance and protection quality of other work of similar nature, prepare the surfaces and apply the coat or coats of paint as directed by the Engineer to accomplish the desired appearance and protection quality. Submit to the Engineer substantial evidence that the standard finish is compatible with the specified finish coat.
- E. Properly protect the shop prime and finish coats against damage from weather or any other cause.
- F. Wherever fabricated equipment is required to be blast cleaned, protect all motors, drives, bearings, gears, etc., from the entry of grit. Equipment found to contain grit shall be promptly and thoroughly cleaned.

END OF SECTION

SECTION 09902

FIELD PAINTING

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all materials, labor, equipment and incidentals required and perform all the painting necessary to complete this Contract in its entirety as specified herein.
- B. It is the intent of this Section to paint all exposed structural and miscellaneous steel; tanks and systems; mechanical and electrical equipment; conveying systems, pipe, fittings and valves; electrical conduit and appurtenances; all as specified in the attached painting schedules and as specified in Section 01340, and all other work obviously required to be painted unless otherwise specified. Minor items not mentioned in the schedule of work shall be included in the work of this Section where they come within the general intent of this Section as stated herein.
- C. Aluminized steel, above roof level, for stacks - Paint with silicone aluminum as specified. Other aluminum-paint only where noted (as is specified). Paint items so noted in Paragraph 1.01B and in accordance with the Paint Color Schedule. Provide vinyl film letters and numbers for markings as specified. Items noted in Paint Color Schedule as having factory finish and other factory finished items obviously are not field painted. The Contractor is responsible for having damaged factory finish painted items repaired or, if so ordered, for replacing items.
- D. The following items will not be painted:
 - 1. Concrete (unless otherwise specified in the painting schedules).
 - 2. Exterior masonry, split face CMU and interior SGFT
 - 3. Finish hardware unless specifically noted otherwise.
 - 4. Non-ferrous metals and stainless steels, unless specifically noted otherwise.
 - 5. Stainless Steel Pipe and Equipment.
 - 6. Factory prefinished architectural components.
 - 7. Packing glands and other adjustable parts and name plates of mechanical equipment.
 - 8. Parts of buildings not exposed to sight, unless specifically noted otherwise.
 - 9. Mechanical equipment which has been finished painted in the factory as specified in Divisions 15.

1.02 RELATED WORK

- A. Valve identification and color scheme and symbols for piping is included in Section 01340.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, the following:
 - 1. Color cards for initial color selections
 - 2. Three sets of 8-in by 8-in samples, on 1/4-in hardboard, of all colors required for all types of paint. Include special colors as required. Resubmit until approved.

1.04 REFERENCE STANDARDS

- A. The Society for Protective Coatings (SSPC)
 - 1. SSPC SP-1 - Surface Preparation Specification No. 1 Solvent Cleaning.
 - 2. SSPC SP-2 - Surface Preparation Specification No. 2 Hand Tool Cleaning.
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

PART 2: PRODUCTS

2.01 MATERIALS

- A. All painting materials shall be by the Tnemec Company, Inc.; equals by and, where scheduled, NSF Standard 61 certified equals by Sherwin Williams; Ameron (VyGuard) or equal. The painting schedule has been prepared on the basis of Tnemec products (unless otherwise noted) and Tnemec recommendations for application. The painting schedule in section 01340 is based on Valspar and Tnemec. No brand other than those named will be considered for approval unless the brand and type of paint proposed for each item in the following schedule together with sufficient data substantiated by certified tests conducted at no expense to the Owner, to demonstrate its equality to the paint(s) named is submitted to the Engineer in writing for approval within 30 days after the Effective Date of the General Contract. The type and number of tests performed shall be subject to the Engineer's approval.
- B. All painting materials shall be delivered to the mixing room in unbroken packages, bearing the manufacturer's brand and name. They shall be used without adulteration and mixed, thinned and applied in strict accordance with manufacturer's directions for the applicable materials and surface and with the Engineer's approval before using.
- C. Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with the finish paints to be used. Refer to Section 09901 for special primers.
- D. No paint containing lead will be allowed. Oil shall be pure boiled linseed oil.

- E. Work areas will be designated by the Engineer for storage and mixing of all painting materials. Materials shall be in full compliance with the requirements of pertinent codes and fire regulations. Proper containers outside of the buildings shall be provided and used for painting wastes and no plumbing fixture shall be used for this purpose.

2.02 COLOR CODING FOR PIPES AND EQUIPMENT

- A. The color code establishes, defines and assigns a definite color for each process system. All elements which are an integral part of the system, that is originating from the equipment and/or supplying the equipment, shall be painted between and up to but not including the fixed flanges nor the flexible conduit connections on the equipment. Valves and fittings shall be painted in the color of the main body of the pipe.
- B. All pipes and equipment shall be painted according to Color Schedule in Section 01340. Elements which are not listed on the Schedule will be assigned a color by the Engineer and shall be treated as an integral part of the Contract.
- C. All hanger saddles and pipe support floor stands shall be painted the same color and with the same paint as the pipe it supports. Hanger rods and hanger rod connections to building structure shall be painted to match the color of the wall or ceiling to which it is attached.

2.03 LETTERING OF TITLES

- A. The name of the materials in each pipeline and alongside this an arrow indicating the direction of flow of fluids, shall be indicated on each pipe system. Titles shall not be located more than 30 linear feet apart and shall also appear directly adjacent to each side of any wall the pipeline breaches, adjacent to each side of the valve regulator, flowcheck, strainer cleanout and all pieces of equipment.
- B. Titles shall identify the contents by complete name at least once in each space through which it passes and thereafter by generally recognized abbreviations, letters or numerals as approved. Identification title locations shall be determined by the Engineer but in general they shall be placed where the view is unobstructed and on the two lower quarters of pipe or covering where they are overhead. Title should be clearly visible from operating positions especially those adjacent to control valves.
- C. Pipe Identification shall conform to the requirements of Section 01340.

2.04 TITLES FOR EQUIPMENT

- A. Titles for equipment shall conform to the requirements of Section 01340.

2.05 TESTING EQUIPMENT

- A. Furnish to the Engineer for use on the Project for paint inspection, wet and dry film thickness gauges and all other equipment required by the Engineer for inspection.

PART 3: EXECUTION

3.01 PREPARATION OF SURFACES

- A. All surfaces to be painted shall be prepared as specified herein and shall be dry and clean before painting. Special care shall be given to thoroughly clean interior concrete and CMU surfaces to receive polyamide cured epoxy paint of all marks before application of finish.
- B. All metal welds, blisters, etc, shall be ground and sanded smooth. All pits and dents shall be filled and all imperfections shall be corrected so as to provide a smooth surface for painting. All rust, loose scale, oil, tar and asphalt bearing coatings, grease and dirt shall be removed by use of approved solvents, wire brushing, grinding or sanding.
- C. All PVC pipe and other plastic matrix surfaces to be painted shall be lightly sanded and cleaned of residue before painting.
- D. Galvanized (except metal deck surfaces), aluminum, and copper surfaces shall have all oxidation and foreign material removed before painting by SSPC SP1, using an approved V.O.C. compliant method. Galvanized and, when ordered, the other metal surfaces specified above shall be hand tool cleaned to SSPC SP2 standards to provide a uniform 1 mil surface profile.
- E. Stainless steel shall be solvent cleaned as specified above and then sanded to achieve a uniform 1 mil profile. Remove all sanding residue.

3.02 PAINTING SCHEDULE

- A. All colors will be based on the color schedule in Section 01340 or as selected by the Engineer.
- B. The following types of paints by Tnemec Co. have been used as a basis for the paint schedule:
 - 1. Hi-build Epoxoline (Series 66) - polyamide cured epoxy
 - 2. Potapox (Series 20) (FC - fast cure where scheduled) - polyamide cured epoxy (NSF Standard 61 certified for contact with water being treated and elsewhere as scheduled).
 - 3. Envirofil (No. 130-6601 olive color) - waterborne cementitious acrylic
 - 4. Endura-Shield III - semi-gloss (Series 73) - high-build acrylic polyurethane enamel.
 - 5. Silicone Aluminum (No. 39-661) - high heat silicone aluminum (to 600 degrees F).
 - 6. Elasto-Shield (Series 264 and trowel grade, Series 265TG) - modified polyurethane (NSF Standard 61 certified).
 - 7. Hydro-Zinc (Series 90 - 91H₂O 2000) - organic vehicle zinc-rich (NSF Standard 61 certified).
 - 8. Vinester (Series 120) - vinyl ester.

9. Tneme-Cryl (Series 6) - acrylic latex emulsion, eggshell finish.
 10. PPG Industries Rez Polyurethane Satin Clear Plastic Interior Varnish 77-89 - Urethane - alkyd, clear, satin sheen with approved Rez alkyd-oil stain under.
- C. The following surfaces shall have the types of paint scheduled below applied at the dry film thickness (DFT) in mils per coat noted:
1. Exterior non submerged ferrous metals.
 - o 1 coat Series 90-91H₂O 2000 on properly prepared unprimed metal or for touch-up (2.0-3.0 DFT)
 - o 1 coat Series 66 (4.0 DFT), 1 coat Series 73 (3.0 DFT)
 2. Interior non-submerged concrete scheduled for painting.
 - o 2 coats Series 66 (5.0 DFT)
 3. Interior concrete masonry units
 - o 1 coat No. 130-6601 (80 sq ft/gal minimum scrub-in to fill voids as approved)
 - o 2 coats Series 66 (5.0 DFT)
 4. Interior non-submerged ferrous metals
 - o 1 coat Series 90-90H₂O 2000 on properly prepared unprimed metal or for touch-up (2.0-3.0 DFT)
 - o 2 coats Series 20 (3.0 DFT) - Room 210 - Process Area
 - o 2 coats Series 66 (3.0 DFT) - Elsewhere
 5. Submerged ferrous metals and ferrous metals subject to submersion or splashing. Surface shall be lightly sanded or abraded before application of first field coat.
 - o 2 coats Series 20 (6.0 DFT)
 6. Plastic piping and, where scheduled to be painted, plastic components
 - o 2 coats Series 66 (3.0 DFT)
 7. Pipe insulation
 - o 1 coat No. 51-792 (Vinyl-Acrylic Sealer - 1.0 DFT), 2 coats Series 66 (3.0 DFT)
 - o (Plastic or metal sheathed insulation-paint as scheduled for appropriate substrate)

8. Aluminum designated to be painted.
 - o Interior
 - o 2 coats Series 66 (3.0 DFT)
 - o Exterior
 - o 1 coat Series 66 (4.0 DFT), 1 coat Series 73 (3.0 DFT)
9. Copper piping
 - o 2 coats Series 66 (3.0 DFT)
10. Hot ferrous metal surfaces
 - o 2 coats Series 39-661 (1.5 DFT)

3.03 WORKMANSHIP

A. General

1. At the request of the Engineer, sample areas of the finished work prepared in strict accordance with this Section shall be furnished and all painting shall be equal in quality to the approved sample areas. Finished areas shall be adequate for the purpose of determining the quality of workmanship. Experimentation with factory or paint manufacturer's warehouse mixed colors shall be furnished to the satisfaction of the Engineer where standard chart colors are not satisfactory.
2. Protection of furniture and other movable objects, equipment, fittings and accessories shall be provided throughout the painting operation. Canopies of lighting fixtures shall be loosened and removed from contact with surface, covered and protected and reset upon completion. Remove all electric plates, surface hardware, etc, before painting, protect and replace when completed. Mask all machinery nameplates and all machined parts not receiving a paint finish. Dripped or spattered paint shall be promptly removed. Lay drop cloths in all areas where painting is being done to adequately protect flooring and other work from all damage during the operation and until the finished job is accepted.
3. On metal surfaces apply each coat of paint at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. One gallon of paint as originally furnished by the manufacturer shall not cover a greater area when applied by spray gun than when applied unthinned by brush. Deficiencies in film thickness shall be corrected by the application of an additional coat(s). On masonry, application rates will vary according to surface texture; however, in no case shall the manufacturer's stated coverage rate be exceeded. On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.

B. Field Priming

1. Steel members, metal castings, mechanical and electrical equipment and other metals which are shop primed before delivery at the site will not require a prime coat on the job. All piping and other bare metals to be painted shall receive one coat of primer before exposure to the weather, and this prime coat shall be the first coat as specified in the painting schedule. Surface preparation of bare metal shall be the responsibility of the Contractor.
2. Equipment which is specified to receive a baked-on enamel finish or other factory finish shall not be field painted unless the finish has been damaged in transit or during installation. Surfaces that have been shop painted and have been damaged, or where the shop coat or coats of paint have deteriorated, shall be properly cleaned and retouched before any successive painting is done on them in the field. All such field painting shall match as nearly as possible the original finish. Preparation and painting shall be provided by the Contractor.
3. Equipment shipped with a protective shop painting coat or coats shall be touched up to the satisfaction of the Engineer with primers as recommended by the manufacturer of the finish paint. Preparation and painting shall be provided by the Contractor.

C. Field Painting

1. All painting at the site shall be under the strict inspection of the Engineer. Only skilled painters and, where dictated by special conditions or systems and so ordered, specialist painters shall be used on the work.
2. All paint shall be at room temperature before applying, and no painting shall be done when the temperature is below 60 degrees F, in dust-laden air, when rain or snow is falling, or until all traces of moisture have completely disappeared from the surface to be painted.
3. Successive coats of paint shall be different shades (from paint manufacturer's stock or shop mixed paint) of the required colors so as to make each coat easily distinguishable from each other with the final undercoat the approximate shade of the finished coat to ensure no show-through as approved.
4. Finish surfaces shall not show brush marks or other irregularities. Undercoats shall be thoroughly and uniformly sanded with the type paper appropriate for the undercoats to remove defects and provide a smooth even surface. Top and bottom edges of doors shall be painted.
5. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. Materials subject to weather shall be primed coated as quickly as possible. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.
6. All painting shall be performed by approved methods with number of coats modified as required to obtain the total dry film thickness specified. Spray painting shall be performed specifically by methods submitted and as approved by the Engineer.

7. All surfaces to be painted as well as the atmosphere in which painting is to be done shall be kept warm and dry by heating and ventilation, if necessary, until each coat of paint has hardened. Any defective paint shall be scraped off and repainted in accordance with the Engineer's directions.
8. Before final acceptance of the work, all damaged surfaces of paint shall be cleaned and repainted as directed by the Engineer.

3.04 CLEANUP

- A. At all times keep the premises free from accumulation of waste material and rubbish caused by employees or work. At the completion of the painting, remove all tools, scaffolding, surplus materials and all rubbish from and about the buildings and leave the work "broom clean" unless more exactly specified.
- B. Upon completion, remove all paint where it has been spilled, splashed, or spattered on all surfaces, including floors, fixtures, equipment, furniture, etc, leaving the work ready for inspection.

END OF SECTION

SECTION 11314

INSTALLATION OF OWNER FURNISHED SCREW CENTRIFUGAL PUMPS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required and install, complete and ready for operation screw impeller centrifugal pumps and seal water systems as shown on the Drawings and specified herein.
- B. The waste activated sludge (WAS) pumps shall be furnished by the Owner as complete pumping units with motors mounted on common baseplates.
- C. Contractor shall obtain the services of the VFD manufactures certified technician to configure the existing VFDs to operate properly with the new pump motors.

1.02 RELATED WORK

- A. Concrete work and Grout is included in Division 3.
- B. Field painting is included in Division 9.
- C. Instrumentation is included in Division 13.
- D. Mechanical piping, valves, pipe hangers and supports are included in the respective sections of Division 15.
- E. Electrical work is included in Division 16.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, copies of all materials required to establish compliance with the specifications. Submittals shall include the following:
 - 1. Anchor bolt materials, sizes and installation detail.
 - 2. Anchor bolt embedment depth calculations to develop anchor bolt yield strength.
 - 3. Anchor bolt adhesive material, performance and application data.
 - 4. Baseplate leveling and shimming detail.
 - 5. Epoxy grout material, performance and application data.
- B. Submit Installation Quality Plans and Records:
 - 1. Contractors anchor bolt installation and baseplate grouting plan.

2. Manufacturer's certification of installation as specified in Part 3.
3. Baseplate leveling measurement record.
4. Coupling alignment record.
5. Field performance testing plan.
6. Vibration signature report.

1.04 REFERENCE STANDARDS

- A. ASTM International
 1. ASTM A48 - Standard Specification for Gray Iron Castings
 2. ASTM A532 - Standard Specification for Abrasion-Resistant Cast Irons
- B. American Iron and Steel Institute (AISI)
- C. Hydraulic Institute (HI)
- D. National Electrical Manufacturers Association (NEMA)
- E. Occupational Safety and Health Administration (OSHA)
- F. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. All pumps shall be installed in accordance with the Drawings, these specifications and the pump manufacturers installation instructions. These specifications contain requirements that exceed the manufacturers installation guidelines
- B. Contractor shall provide the services of the pump manufacturers representative for assistance in installation and testing as specified later herein.
- C. Contractor shall provide the services of a certified vibration testing firm to perform field vibration signature, and ensure the vibration limits meet the requirement of HI 9.6.4- Centrifugal and Vertical Pumps for Vibration Measurements and Allowable Values. A vibration signature report shall be provided to the Owner and Engineer.

1.06 DESCRIPTION OF SYSTEMS

- A. The Owner shall furnish four WAS pumps for installation by the Contractor for the following service:
 1. The pumps shall be utilized for pumping waste activated sludge from the Influent Well to the Main Thickener Distribution Box.

2. Three pumps shall be operated in parallel to produce a maximum flow of 10,400 gpm at 117 ft TDH at approximately 99% of full speed.
 3. Two pumps shall be operated in parallel at reduced speed to produce a minimum flow of 5000 gpm at 72 ft TDH at reduced speed.
 4. Pumps shall be controlled by existing variable frequency drives installed in the MCCs in the WAS Pump room.
- B. The pumps shall be as follows:
- | | |
|---------------------|--|
| Name: | WASP No. 1 through WASP No. 4 |
| Location: | WAS Pump Room |
| Number of Units: | Four |
| Configuration: | Horizontal end suction, direct coupled |
| Capacity and Head: | 3500 GPM at 120 ft. total head at 1785 rpm |
| Manufacturer/Model: | 10 x 8 Wemco Hidrostral H8K-M-H4SM |
- C. The system curves applicable to these pumps are included as an attachment to this Section.

1.07 INSTALLATION AND START-UP ASSISTANCE

- A. Copies of an operating and maintenance manual shall be furnished by the Owner to the Contractor and Engineer prior to installation.
- B. A factory representative of the pump manufacturer who has complete knowledge of proper operation and maintenance shall be provided **by the Contractor** to provide assistance during installation, certify the installation is correct for warranty purposes and witness field performance testing. If there are difficulties in operation of the equipment because of the manufacturer's design or fabrication, additional service shall be provided at no additional cost to the Owner. The listed service requirements are exclusive of travel time, do not have to be consecutive days, and shall not limit or relieve the Contractor of the obligation to provide sufficient service necessary to place the equipment in satisfactory and functioning condition.
 1. Installation and Start-Up: Complete review of installation in accordance with Section 01700. Provide written certification that the installation is complete and operable in all respects, and that no conditions exist which may affect the warranty. Provide written report, summarizing test procedures, tested and measured variables (flows, pressures, shaft-speed, vibration measurements, alignment check, etc.):
 - a. **Two (2)**, four-hour days for installation inspection
 - b. **Two (2)**, four-hour days for start-up inspection

1.08 DELIVERY, STORAGE AND HANDLING

- A. Owner shall store the pumps in the Owner's facility **until the Contractor is ready to take possession for installation.**
- B. Contractor shall be responsible for providing transportation of the pumps the WAS Pump Station and for offloading and delivering the pumps to the Pump Room.

- C. All equipment and parts shall be properly protected against any damage during transport, rigging and handling. Should the Contractor need to store the equipment after taking delivery, the Contractor shall store equipment in accordance with the manufacturer's instructions.
- D. Factory assembled parts and components shall not be dismantled for transport.
- E. The finished surfaces of all exposed flanges shall be protected by wooden or equivalent blank flanges, strongly built and securely bolted thereto.
- F. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Screw Impeller Centrifugal Pumps

1. The pumps shall be of the horizontal, direct drive, heavy duty, non-clogging, single suction, helical screw centrifugal type.
2. The pumps shall be furnished by the Owner to the Contractor for installation and start-up.
3. The pumps shall be complete units with pump, bearing frame, coupling and motor mounted on a common baseplate.

B. Anchor Bolts and Installation Materials

1. Contractor shall furnish type 316 stainless steel anchor bolts, nuts, washers and epoxy anchor cement for each pump.
2. Anchor bolts length and diameter shall be as shown on the Drawings.
3. 316 SS baseplate leveling shims, 316 SS machinists pump/driver alignment shims, epoxy grout form material, form release agent and all other ancillary material shall be furnished and installed by the Contractor.

C. Epoxy Grout

1. Baseplate Grout shall be a three part epoxy grout as specified in Section 03600.

PART 3: EXECUTION

3.01 INSTALLATION

- A. The existing pumps shall be removed from the concrete pads without damaging the pumps and drivers. **The existing pumps, motors and baseplates shall be removed from the pump station and loaded on the Owners vehicles.**
- B. The top ½ to 1 inch of concrete shall be removed from the existing equipment pads to level the pad, expose the aggregate, remove soiled or stained concrete and provide space for shimming the equipment pads to align the pump suction centerlines with the existing suction wall pipe

- centerlines. The existing anchor bolts shall be cut flush with the newly exposed concrete surface.
- C. The new anchor bolt locations shall be marked out and the equipment pads shall core drilled, holes thoroughly cleaned and new anchor bolts secured plumb in proper horizontal location with temporary template system and installed with anchoring cement. The anchor bolt installation shall be as shown on the Drawings. Bond breaker shall be applied to the anchor bolts above cement height and closed cell foam shall be inserted in the anchor bolt pockets as shown on the Drawings.
 - D. The pumps shall be decoupled, the motors removed and the underside of the baseplate shall be blasted to SSSP 6 finish and cleaned of all residuals. If baseplates are not set soon after preparation, apply epoxy primer of type approved by grout manufacturer.
 - E. The pump and baseplate shall then immediately be installed on the concrete pads, leveled with shims on either side of each anchor bolt and secured in place by snugging the anchor nuts. Record level measurements in two directions at both ends of baseplate on a baseplate drawing noting measurement location. Leveling nuts on the anchor bolts under the baseplates shall not be used for baseplate leveling. Shims shall be coated with bond breaker to facilitate removal after grout cure. Heavily waxed grout forms shall be installed in such a manner to execute a 1 step grout pour for the main baseplate and a subsequent pour for the motor plate.
 - F. Prior to placing grout, the Contractor shall prepare and submit a grouting plan for Engineers review, which shall include a list of all required materials and equipment and shall show the grouting procedure will be executed in one step without interruption and within the working time of the grout.
 - G. The specified epoxy grout shall be mixed to proper proportions and placed under the equipment baseplate, completely filling all voids in the pump baseplate and the motor mounting plate. The forms shall fabricated with a head box to pressurize the grout pour into the baseplate. All air shall be evacuated from under the baseplates by rodding or other means. Vibrators shall generally not be used for epoxy grout, conform to manufacturers instructions. After cure of the grout, leveling shims shall be removed, the voids filled with epoxy grout and the nuts on the anchor bolts shall be tightened securely.
 - H. The motors shall be installed and wired, but not coupled. The motors shall be operated under no load to determine that no objectionable noise or vibration emanates from the motors. Proper rotation shall also be confirmed.
 - I. The pumps shall be aligned by qualified Millwrights and coupled. Alignment may be performed by dial indicators or laser. Motors shall be shimmed to achieve alignment as required. Pumps shall not be shimmed. Motors mounting bolts shall be tightened and alignment re-checked. Submit alignment record showing axial and planar alignment measurements achieved. Upon confirmation of alignment, coupling shall be completed. Pumps shall not be operated until all instruments are installed and tested and the seal water systems are installed and functional.
 - J. Submit a certificate from the manufacturer stating that the installation has been found to be in complete accordance with the manufacturer's requirements, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication, and care of the equipment. Field test shall not be conducted until such time that the

entire installation is complete, the installation certificate is submitted and approved and the units are ready for testing.

3.02 FIELD PAINTING

- A. Field painting is included in Section 09902.

3.03 FIELD INSPECTION AND TESTING

- A. Furnish the services of a factory representative of the pump manufacturer for a minimum number of days as specified herein, who has complete knowledge or proper operation and maintenance to inspect the final installation, to supervise a test run of the equipment and to provide a certification of proper installation.
- B. After the pumps have been completely installed, the Contractor (working under the direction of the manufacturer) shall conduct in the presence of the Engineer, such tests as are necessary to indicate that pump efficiency and discharge conform to these Specifications. Field tests shall include all pumps included under this section.
- C. Operate each pump for a minimum of four hours, during which time the head, flow, and power draw shall be recorded. Operate suction and discharge valves to simulate various head conditions. The installed magnetic flow meter and calibrated pressure gauges furnished by the Contractor shall be utilized to determine the pump operating characteristics. Assist the Engineer as required in taking all data. Pump performance, as determined by the field data, shall conform to the characteristics specified herein. Each pump shall operate without excessive noise, vibration, or overheating.
- D. Provide the services of a machine vibration specialist to record each pump vibration signature in three planes to determine conformance with vibration limits of HI 9.6.4. Field vibration limits shall not exceed 0.31 inches per second RMS when the pumps are operating in their POR.
- E. If any unit fails to fulfill the performance required by these specifications, corrective measures shall be taken by the Contractor and the units retested to assure full compliance with these Specifications. A revised written report shall be submitted to the Engineer.
- F. All costs associated with the field tests or any required corrective action shall be borne by the Contractor.

END OF SECTION

SECTION 11392

WASTEWATER SAMPLER

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, services and incidentals required and install one stationary composite self-contained polyethylene or fiberglass refrigerated wastewater sampler as shown on the Drawings and as specified herein.
- B. One sampler shall be installed to collect samples of the wastewater from the 20" Waste Sludge Line as shown on the Drawings
 - 1. A wastewater sampler shall collect samples from 20" Waste Sludge Line downstream of the Waste Activated Sludge (WAS) Pumping Station. The sampler shall be located in the O&M Building Basement's existing sampler and shall withdraw samples with a vacuum compressor capable of a suction lift as specified herein.
- C. All auxiliary and accessory devices necessary for the equipment performance shall be included.

1.02 RELATED WORK

- A. Special Provisions are included in Section 01170.
- B. Electric Motors are included in Section 01171.
- C. Warranties are included in Section 01740.
- D. Miscellaneous metal is included in Division 5.
- E. Instrumentation and control work, except as specified herein, is included in Division 13. Instrumentation and controls provided in this section shall adhere to Instrumentation and Control Specification Sections in Division 13.
- F. Mechanical piping, pipe hangers and supports are included in Division 15.
- G. Electrical work is included in Division 16.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, copies of all materials required to establish compliance with this Section. Submittals shall include the following:
 - 1. Certified shop drawings showing all details of construction, dimensions and anchor bolt locations.
 - 2. Descriptive literature, bulletins and/or catalogs of the equipment.
 - 3. The total weight of the equipment.

4. A complete total bill of materials for all equipment.
 5. A list of the manufacturer's recommended spare parts with the manufacturer's current price for each item. Include gaskets, packing, etc.
 6. All information required by Section 01170 and 01171.
 7. Complete wiring schematics and control wiring diagrams showing all details of controls and connections to remote instrumentation furnished under Division 13.
- B. In the event that it is impossible to conform with certain details of this Section due to different manufacturing techniques, describe completely all nonconforming aspects.
- C. Operating and Maintenance Data
1. Copies of an operating and maintenance manual shall be furnished to the Engineer as provided for in Section. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc, which are required to instruct operating and maintenance personnel unfamiliar with such equipment.
 2. A factory representative who has complete knowledge of the operation and maintenance of the equipment shall be provided for one day to instruct representatives of the Owner in the use of the equipment. This O&M instruction may be combined with the work required for manufacturer's installation and check out service as provided under paragraph 3.02 below. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no additional cost to the Owner.
 3. As specified in Paragraph 3.02, additional service time shall be provided during the one year warranty period for three visits to check and readjust the equipment supplied under this section.

1.04 QUALITY ASSURANCE

- A. All the equipment specified under this section shall be furnished by a single manufacturer and shall be products of a manufacturer regularly engaged in the production of such equipment. The manufacturer shall have the sole responsibility for the proper functioning of the sampling unit.
- B. Any reference to a specific manufacturer or model number is for the purpose of establishing a quality or parameter for specification writing and is not to be considered proprietary. In all cases any source or device is acceptable that has the quality and operating capabilities specified.
- C. The supplier shall be prepared to provide parts and service as required.

1.05 SYSTEM DESCRIPTION

- A. The wastewater samplers shall be furnished with a controller and be fully automatic, suitable for collecting composite samples from the Waste Sludge Line. Operation shall be by an integral vacuum pump contained within the sampler or in a separate pocket of the sampler's molded frame capable of the suction lift specified herein through flexible tubing to a monitoring trough.

- B. The samplers shall operate on a timed or flow proportional basis. The input signal for flow proportional control shall be a 4-20 mADC signal proportional to flow from an existing flow transmitter that will be sent to the sampler from a control panel furnished under Division 13. Sampler shall provide a common alarm output to the control panel furnished under Division 13.

1.06 PATENTS AND LICENSES

- A. The supplier of the sampler shall be responsible for all patents or licenses that exist because of the sampler that may be provided.
- B. The supplier shall assume all costs of patent fees or licenses for the equipment or process and shall safeguard and save harmless the Owner from all damages, judgements, claims and expenses arising from license fees, or claimed infringement of any letters, patent or patent rights, or fees for the use of any equipment or process, structural feature or arrangement of any of the component parts of the installation.

1.07 MAINTENANCE

A. Tools and Spare Parts

1. Furnish special tools and spare parts in accordance with Section 01170.
2. One year supply of spare parts shall be furnished for each sampler as recommended by the manufacturer. Spare parts for each sampler shall include at least the following:
 - a. Two replacement bottle
 - b. Two replacement intake hose
 - c. Two inlet strainer
 - d. Two pressure switch
 - e. Two replacement pinch/discharge tubing.

1.08 WARRANTY

- A. The Contractor shall obtain from the manufacturer its warranty that the equipment shall be warranted for a period of 1 year from the date of Substantial Completion, as defined in the General Conditions, Division 0 and specified in Section 01740, to be free from defects in workmanship, design or material. If the equipment should fail during the warranty period due to a defective part(s), the part(s) shall be replaced in the equipment and the unit(s) restored to service at no expense to the Owner.

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Each sampler shall be operated by a vacuum pump capable of the specified suction lift with the fluid not coming in contact with any working parts. The operation shall be:
 1. The signal from the flow meter or cycle timer shall start the sampling sequence, start the pump in pressure mode to pre-purge all liquid from the sample pick up tube.
 2. The sequencer shall then switch the pump to vacuum mode, thereby drawing a preselected sample volume through the intake tube into the sample bottle.

3. After the proper sample volume is obtained, a post sample purge of the intake tube shall be initiated by the sequencer by switching pump to pressure mode.

2.02 WASTE SLUDGE LINE SAMPLERS

- A. The sampler controller shall house all controls and pump drive and be mounted on top of a refrigeration unit. The interface for incoming flow signal shall be housed in the sampler controller or a separate water resistant weather tight enclosure mounted on the sampler. The controller enclosure shall be NEMA 12 and rated for indoor installation and have a gasketed key lock door for access to interior. The dimensions of the sampler enclosure shall be 24" x 22" x 19". The sample controller compartment shall be capable of being padlocked. A keypad shall be provided on the totalizer.
- B. The refrigerator for each sampler shall be capable of holding at least two 5 gallon polyethylene containers and shall have rigid foamed in place insulation which shall provide strength and shall not support bacterial growth. The refrigerator shall be capable of maintaining a sample temperature of 0 to 4 degrees C. The refrigerant used shall be a non-CFC refrigerant with an ozone depletion potential of zero.
- C. A compressor with a minimum rating of 1/3 horsepower shall be provided for each sampler. The compressor shall be equipped with a temperature safety cutout that will disengage the compressor if a temperature of 221 degrees F is reached. The refrigeration system shall have a 5 minute recovery time to return the sample enclosure to 39 degrees F after the door has been opened for 1 minute in 75 degree F ambient conditions. The collected samples shall be stored in an enclosure capable of operating in ambient temperatures from minus 20 degrees F to 120 degrees F.
- D. Each sample suction line shall be 5/8 in I.D. flexible nylon-reinforced PVC tubing furnished with a weighted PVC or SS strainer. Adequate suction line shall be provided for the sampler location. Furnish tube couplings as required to attach the tubing to the pump.
- E. Each sampler shall include at least the following features:
 1. Vacuum pump.
 2. Automatic sampler controller.
 3. On off main power toggle switch.
 4. Sample volume selector switch, for sample size of 20 to 1000 ml in infinite increments.
 5. Adjustable temperature control for refrigerator.
 6. The sampler shall operate on 120 Volt, single phase, 60 Hz power supply.
- F. The samplers shall be capable of drawing a sample up to a lift of 28 ft and a total run of up to 50 ft length of 5/8 in I.D. flexible nylon-reinforced PVC or clear PVC. The unit shall be capable of withdrawing a sample from the location shown on the Drawings. Volume shall be adjustable between 20 to 1000 ml in infinite increments, and allow solids up to 3/16 in diameter to pass. Sample volume repeatability shall be plus or minus 5 percent of the selected sample volume.

- G. Sample pump speed shall be such as to produce a sampling line velocity of at least 2.2 fps at 25 ft lift. The pump shall have a capacity of 3,000 ml/min at 12-ft head.
- H. Each sampler shall be furnished with two composite polyethylene sample containers, 5 gallon capacity. Containers shall be wide mouthed for easy cleaning.
- I. All samplers shall be Manning Environmental Inc., Model S52AA1C2G1AA1, Florence, TX or equal.

2.03 WSL SAMPLER FLOW THROUGH CHAMBER

- A. Furnish with the WSL sampler a flow through chamber from which the WSL sampler shall take samples.
- B. The chamber shall be adaptable for use with any sampler. Connections to the sampling will be made using standard 5/8-inch nylon-reinforced hose from the 4-inch sample ports.
- C. The flow through chamber shall be supplied with Viton O-rings and unions.
- D. The flow through chamber shall be fully supported from the floor in a similar manner as the existing adjacent units using industrial grade pipe support components fabricated of steel and hot dip galvanized in accordance with Section 15140.
- E. The flow through chamber shall be manufactured by Ryan Herco Flow Solution in Branchburg, NJ per Section 2 on Drawing M-3 in the construction drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. The sampling equipment shall be installed in accordance with the manufacturer's instructions and located as shown on the Drawings or as approved by the Engineer.
- B. The fiberglass reinforced pad furnished with the sampler shall be installed on the concrete surface as shown on the Drawings and the pad leveled prior to placing the sampler on top of the pad.

3.02 MANUFACTURER'S SERVICE

- A. Furnish the services of a qualified serviceman of the equipment manufacturer to perform the following:
 - 1. Supervision
 - a. Checking the installation of all components before power is applied.
 - 2. Check Out
 - a. Placing the equipment into operation and making necessary adjustments. Additional service time shall be provided during the one year warranty period for three visits to check and readjust the equipment supplied under this section.
 - 3. Instruction

- a. As specified in Paragraph 1.03 C.

END OF SECTION

SECTION 13300
INSTRUMENTATION AND CONTROLS – GENERAL PROVISIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall procure the services of a Process Control System Supplier (PCSS) to furnish and install all materials, equipment, labor and services, required to achieve a fully integrated and operational system as specified herein, in the Specification Sections listed below, and in related drawings, except for those services and materials specifically noted
- B. The work shall include furnishing, installing and testing the equipment and materials detailed in the following sections:

<u>Section No</u>	<u>Title</u>
13300	Instrument and Controls (I&C) – General Provisions
13302	Testing
13303	Training
13305	Control Descriptions
13306	Application Engineering Services
13311	PLC Hardware and Software
13330	Control Panels and Panel Mounted Equipment
13335	Control Panel UPS (Single-Phase)
13340	Instruments
13341	Flow Devices
13343	Pressure Devices

- C. Auxiliary and accessory devices necessary for system operation or performance, such as transducers, relays, signal amplifiers, intrinsic safety barriers, signal isolators, software, and drivers to interface with existing equipment or equipment provided by others under other Sections of these specifications, shall be included whether they are shown on the Drawings or not
- D. All equipment and installations shall satisfy applicable Federal, State and local codes
- E. Use the equipment, instrument, and loop numbering scheme shown on the Drawings and specifications in the development of the submittals. Do not deviate from or modify the numbering scheme without the Engineer's approval.
- F. The Passaic Valley Sewerage Commission is an existing facility, and all work shall be coordinated with their operating personnel to minimize impact on daily operation.
- G. Equipment and services the PCSS shall be responsible for shall include, but not be limited to the following:
 - 1. Furnish and provide overall installation, configuration, and modification of instrumentation, programmable logic controllers (PLCs), networking equipment, and other control system equipment as specified and indicated on the drawings.

2. Provide all PLC programming, configuration, and Operator Interface Terminal (OIT) configuration including development of control programs, database configuration, graphic screens, and communication links as specified herein.
3. Coordination with the Owner to ensure that the equipment and services provided under this contract seamlessly integrate with the existing overall SCADA system.
4. Equipment and services the PCSS shall be responsible for shall include, but not be limited to the following:
5. The PCSS shall perform the following at RAS/WAS MCC Room:
 - a. Remove from service and turn over to the owner the following existing equipment:
 - 1) The following PLC and Remote I/O (RIO) components shall be removed from service and turned over to the Owner:
 - a) Allen-Bradley PLC-5 CPU Rack and associated hardware
 - b) RIO Rack 1-2
 - c) RIO Rack 3-4
 - 2) Prior to demolishing any of the existing PLC equipment, each field I/O wire terminated to the existing PLC or to the existing RIO racks shall be labeled. An I/O list that provides a summary of the existing I/O points has been included as Appendix A to this specification section. The I/O list shall be used for reference only. Actual I/O must be field verified by the contractor.
 - 3) Existing Cisco Ethernet switch shall be removed from service and turned over to the Owner.
 - 4) The existing fiber optic cable and associated patch panels located within the existing RAS/WAS Control Panel shall remain in service.
 - 5) The existing Transition Fiber Optic Transceivers (media converters) located within the existing RAS/WAS Control Panel shall remain in service and shall be connected to the new Ethernet Switch (see below)
 - 6) The existing Allen-Bradley PanelView Plus OIT located on the front of the RAS/WAS Control Panel shall remain in service. The graphic displays shall be modified as explained in these specifications.
 - b. Furnish, install, and configure the following new equipment as indicated on the drawings and as specified.
 - 1) PLC-RASWAS and associated subpanel for installation into the existing RAS/WAS Control Panel. PLC-RASWAS shall tie into the existing plant Ethernet network. Refer to Section 13311 for PLC requirements.
 - 2) The new PLC-RASWAS shall be programmed per the requirements of Sections 13305 and 13306.
 - 3) Contractor shall be responsible for landing all existing IO and well as all new I/O into the new PLC-RASWAS.
 - 4) Revise graphics on existing Panelview Plus OIT to include modifications required by Sections 13305 and 13306.
 - 5) Ethernet switch ES-RASWAS shall be provided by the Owner's IT group and shall be installed by the PCSS. Connect Ethernet switch to existing plant fiber optic Ethernet network via the existing fiber optic transceivers and all devices as indicated on drawing I-2.
 - 6) The two existing fiber patch panels shall be relocated in the existing enclosure.
 - 7) Furnish and install a new UPS to power the control system and instrumentation. Refer to Section 13335 for UPS requirements.

- c. The existing WAS Pump VFDs shall be tied into the new Ethernet switch via CAT6 cable as indicated on the drawings. The PLC shall be programmed to pull signals into the VFD via Ethernet/IP protocol.
6. The PCSS shall perform the following at the Waste Sludge Pump Room:
 - a. Remove from service and turn over to the owner the following existing equipment:
 - 1) The following PLC and Remote I/O (RIO) components shall be removed from service and turned over to the Owner:
 - a) RIO Rack 5-6
 - 2) Prior to demolishing any of the existing PLC equipment, each field I/O wire terminated to the existing PLC or to the existing RIO racks shall be labeled. An I/O list that provides a summary of the existing I/O points has been included as Appendix A to this specification section. The I/O list shall be used for reference only. Actual I/O must be field verified by the contractor.
 - b. Furnish, install, and configure the following new equipment as indicated on the drawings and as specified.
 - 1) OIT-RASWAS and associated enclosure. OIT-RASWAS shall tie into the existing plant Ethernet network via CAT6 cabling terminated at the ES-RASWAS located in the RAS/WAS Control Panel in the MCC Room. Refer to Section 13311 for OIT requirements and Section 13330 for enclosure requirements.
7. The existing WAS Pump discharge valves (FCV-511, 512, 513, 514) shall be tied into the new PLC-RASWAS via RS-485 cabling, and shall communicate using the Modbus protocol to a Prosoft Limitorque Valve Network Interface Module which shall be furnished, installed, and configured in the ControlLogix chassis.
 - a. The existing valve actuators currently have the capability to communicate via Modbus. No additional actuator hardware is required to establish communications, but any additional configuration required for the valves to communicate with the interface module on the PLC shall be provided.
 - b. The valves shall be wiring in a loop configuration as indicated on Drawing I-2 and shall automatically restore communication upon communication failure.
8. Revise graphics on the existing plant Wonderware Human-Machine Interface (HMI) system. Refer to Section 13305 and 13306 for additional requirements.

1.02 RELATED WORK

- A. Instrumentation and Controls conduit systems are specified in Section 16110.
- B. Instrumentation signal cable and alarm and status wiring are specified in Section 16120.
- C. Relevant equipment Sections in Divisions 11, 13, and 15.

1.03 SUBMITTALS

- A. General Requirements:
 1. Refer to Section 01300 for general submittal requirements.

2. Shop drawings shall demonstrate that the equipment and services to be furnished comply with the provisions of these specifications and shall provide a complete record of the equipment as manufactured and delivered.
3. Submittals shall be complete; giving equipment specifications, details of connections, wiring, ranges, installation requirements, and specific dimensions. Submittals consisting of only general sales literature shall not be acceptable.
4. Substitutions on functions or type of equipment specified shall not be acceptable unless specifically noted.
5. Separate submittals shall be made for each submittal listed below.

B. Qualifications Submittal:

1. Submit, within 30 calendar days after Notice to Proceed, detailed information on staff and organization to show compliance with the Quality Assurance requirements of this Section. The Qualifications submittal shall be submitted and approved before any further submittals will be accepted. Failure to meet the minimum requirements shall be grounds for rejection as a PCSS. The Qualifications Submittal shall, as a minimum, contain the following:
 - a. Copies of ISA CCST Level 1 certificates for all field technicians or resumes demonstrating field experience.
 - b. Notarized statement from the firm's financial institution demonstrating ability for the firm to meet the obligations necessary for the performance of the work.
 - c. Copy of UL-508 certificate for panel fabrication facilities.
 - d. Project references for water or wastewater projects as defined in the Quality Assurance paragraphs.
 - e. Documentation to demonstrate the ability to complete this project including: resumes of key staff, financial capacities, details on engineering, design, fabrication, and field service capacity, and location of staff responsible for responding to the site within four hours to resolve startup issues.

C. Project Plan, Deviation List, and Schedule Submittal:

1. Submit, within 45 calendar days after Notice to Proceed, a Project plan. The Project Plan shall be submitted and approved before further submittals shall be accepted. The Project Plan shall, at a minimum, contain the following:
 - a. Overview of the proposed control system describing the understanding of the project work, a preliminary system architecture drawing, interfaces to other systems, schedule, startup, and coordination. A discussion of startup, replacement of existing equipment with new, switchover (Maintaining Plant Operations during system transition), approach to testing and training, and other tasks as required by these specifications shall be included as applicable.
 - b. Preliminary list of HMI software, PLC software, and PLC hardware, including version numbers, solely to determine compliance with the requirements of the Contract Documents prior to beginning development of system programming. Review and approval of software and hardware systems as part of this Project Plan stage shall not relieve the PCSS of meeting all the functional and performance requirements of the system as specified herein. Substitution of manufacturer or model of these systems after the submittal is approved is not allowed without Engineer approval.

- c. Project personnel and organization including the PCSS project manager, project engineer, and lead project technicians. Include resumes of each these individuals and specify in writing their commitment to this project. These do not need to be submitted again if already submitted in the Qualification submittal.
 - d. Sample formats of the shop drawings to be submitted and in conformance with the requirements of the Specifications. At a minimum include samples of panel fabrication drawings, loop, and I/O wiring diagrams.
 - e. List of all graphics intended to be created for this project.
 - f. List of all PLC programs that will be created or modified for this project.
 2. Exceptions to the Specifications or Drawings shall be clearly defined in a Deviation List. The Deviation List shall consist of a paragraph by paragraph review of the Specifications indicating acceptance or any proposed deviations, the reason for exception, the exact nature of the exception and the proposed substitution so that an evaluation may be made by the Engineer. If no exceptions are taken to the specifications or drawings the PCSS shall make a statement as such. If there is no statement by the PCSS, then it is acknowledged that no exceptions are taken.
 3. Project schedule shall be prepared in Gantt chart format clearly showing task linkages for all tasks and identifying critical path elements. PCSS schedule must be based on the General Contractor schedule and must meet all field installation, testing, and start-up milestones in that schedule. The project schedule shall illustrate I&C related major project milestones including the following:
 - a. Schedule for all subsequent project submittals. Include the time required for Contractor submittal preparation, Engineer's review time, and a minimum of two complete review cycles.
 - b. Proposed dates for all project coordination meetings.
 - c. Hardware purchasing, fabrication, and assembly (following approval of related submittals).
 - d. Software purchasing and configuration (following approval of related submittals).
 - e. Shipment of instrument and control system equipment.
 - f. Installation of instrument and control system equipment.
 - g. Testing: Schedule for all testing.
 - h. Schedule for system cutover, startup, and/or going on-line for each major system. At a minimum include the schedule for each process controller and HMI server/workstation provided under this Contract.
 - i. Schedule for all training including submittal and approval of O&M manuals, factory training, and site training.
- D. Input/Output (I/O) List Submittal:
 1. Submit, within 60 days after Notice to Proceed, a complete system Input/Output (I/O) address list for equipment connected to the control system under this Contract.
 2. I/O list shall be based on the P&ID's, the Drawings, the design I/O list (if included), and requirements in the Specifications.
 3. The I/O list shall be submitted in both a Microsoft Excel readable electronic file format and an 8-1/2 inch by 11-inch hard copy.

4. The I/O list shall reflect all active and spare I/O points. Add points to accommodate spare I/O as required in the specifications.
 5. The I/O list shall be arranged such that each control panel has a dedicated worksheet. At a minimum, I/O worksheet shall include the following information:
 - a. TAG NUMBER(S): As indicated on the Drawings, the identifier assigned to a device that performs a function in the control system. As part of this information, the loop number of the tag shall be broken out to allow for sorting by loop.
 - b. DESCRIPTION: A description of the function of the device (text that includes signal source, control function, etc.) Include the text "Spare Points" for all I/O module points that are not connected to equipment.
 - c. PHYSICAL LOCATION: The Control Panel designation of where the I/O point is wired to.
 - d. Physical POINT ADDRESS: Rack, Slot, and Point (or Channel) assignment for each I/O point.
 - e. I/O TYPE: use DO - Discrete Output, DI - Discrete Input, AO - Analog Output, AI - Analog Input, PI - Pulse Input, or PO - Pulse Output.
 - f. RANGE/STATE: The range in engineering units corresponding to an analog 4-20 mA signal, or, the state at which the value of the discrete points are "1."
 - g. ENGINEERING UNITS: The engineering units associated with the Analog I/O.
 - h. ALARM LIMITS: Include alarm limits based on the control descriptions and the Drawings.
 - i. P&ID - the P&ID or drawing where the I/O point appears on. Mark as "NA" (Not Applicable) if the I/O point is derived from a specification requirement and is not on the P&IDs.
 - j. LOGICAL POINT ADDRESS: I/O address of each point.
 6. The I/O list shall be sorted in order by:
 - a. Physical location.
 - b. I/O Type.
 - c. Loop Number.
 - d. Device Tag.
 7. Once the I/O list is approved, the PLC I/O addresses shall not be modified without approval by the Engineer.
 8. For I/O layout requirements, see the PLC Section 13311.
- E. Field Instruments Submittal:
1. Refer to the Instruments section 13340 for submittal requirements.
- F. Hardware and Software Packages Submittal:
1. Refer to the sections below for specific Hardware and Software Packages submittal requirements:
 - a. 13311 - PLC Hardware and Software.
 - b. 13320 - Control and Data Network Equipment.
 - c. 13335 - Control Panel UPS (Single-Phase)

2. For each hardware and software packages component specified in the sections above, submit a cover page that lists, at a minimum, date, specification number, product name, manufacturer, model number, Location(s), and power required. Preferred format for the cover page is ISA-TR20.00.01-2001 (updated in 2004-2006), general data sheet; however, other formats will be acceptable provided they contain all required information.

G. Panel Layout Drawings and Wiring Diagrams Submittal

1. Where direct hardwired interfaces exist between the PCSS control panels and vendor provided control panels furnished under other Divisions, the Contractor shall provide to the PCSS the approved submittals in order for the PCSS to provide complete wiring diagrams showing all wiring connections in the I/O system. This includes but is not limited to terminal block numbering, relay contact information, instruments, equipment, and control panel names. These drawings shall be included in the Final O&M submittal. Leaving this information blank on the Final Documentation drawings is not acceptable.
2. Panel Layout Drawings: Drawings shall be furnished for all panels, consoles, and equipment enclosures specified. Panel assembly and elevation drawings shall be drawn to scale and detail all equipment in or on the panel. Panel drawings shall be 11"x17" in size. At a minimum, the panel drawings shall include the following:
 - a. Interior and exterior panel elevation drawings to scale.
 - b. Nameplate schedule.
 - c. Conduit access locations.
 - d. Panel construction details.
 - e. Cabinet assembly and layout drawings to scale. The assembly drawing shall include a bill of material on the drawing with each panel component clearly defined. The bill of material shall be cross-referenced to the assembly drawing so that a non-technical person can readily identify all components of the assembly by manufacturer and model number.
 - f. Fabrication and painting specifications including color (or color samples).
 - g. Construction details, NEMA ratings, intrinsically safe barrier information, gas sealing recommendations, purging system details, etc. for panels located in hazardous locations or interfacing to equipment located in hazardous areas.
 - h. For every control panel, heating and cooling calculations for each panel supplied indicating conformance with cooling requirements of the supplied equipment and environmental conditions. Calculations shall include the recommended type of equipment required for both heating and cooling.
 - i. Submit evidence that all control panels shall be constructed in conformance with UL 508 and bear the UL seal confirming the construction. Specify if UL compliance and seal application shall be accomplished at the fabrication location or by field inspection by UL inspectors. All costs associated with obtaining the UL seal and any inspections shall be borne by the Contractor.
3. Panel Wiring Diagrams: Panel wiring diagrams depicting wiring within and on the panel as well as connections to external devices. If ISA Loop Wiring Diagrams are specified below, equipment external to the control panel and related external connections do not need to be shown on the Panel Wiring Diagrams. Panel wiring diagrams shall include power and signal connections, UPS and normal power sources, all panel ancillary equipment, protective devices, wiring and wire numbers, and terminal blocks and numbering. Field device wiring shall include the device ISA-tag and a unique numeric identifier. The

diagrams shall identify all device terminal points that the system connects to, including terminal points where I/O wiring lands on equipment not supplied by the PCSS. Wiring labeling used on the drawings shall match that shown on the Contract Documents or as developed by the PCSS and approved by the Engineer. I/O wiring shall be numbered with rack number, slot number, and point number. Two-wire and four-wire equipment shall be clearly identified and power sources noted. Submit final wire numbering scheme. Panel drawings shall be 11" x17" in size.

4. ISA Loop Wiring Diagrams: Drawings shall be prepared in accordance with ISA Standard S 5.4 latest edition with the layout following Figures 5 (shown in the S 5.4 Standard), titled Minimum Required Items Plus Optional items". Loop drawings shall be 11"x17" in size.

H. Testing Plan Submittals:

1. Refer to Section 13302 - Testing for specific testing submittal requirements.

I. Training Plan Submittals:

1. Refer to Section 13303 for specific training requirements.

J. Spares, Expendables, and Test Equipment Lists Submittal:

1. Submit a list of, and descriptive literature for, spares, expendables, and test equipment.
2. Submit a list of, and descriptive literature for, additional spares, expendables, and test equipment recommended by the manufacturer.
3. Submit unit and total costs for the additional spare items specified or recommended for each subsystem.

K. Operator Interface

1. Submit a draft of all proposed graphic displays, examples of each type of pop-up (faceplate) displays, and examples of trends. For those graphics which will be duplicated more than once for similar type of equipment, submit the graphics for the first equipment only.
2. Following the draft graphics review meeting and prior to the factory test, submit a ready-for testing version of all graphic displays. These graphics should be completely finished other than the incorporation of comments and changes resulting from testing.
3. Submitted graphic displays and trends shall be no less than 8.5 inches by 11 inches and in full color.

L. Controller Program Submittal

1. The programmable logic controller program needs to be submitted for approval to the Engineer and Owner prior to scheduling any factory testing. The program shall be submitted in both, its native format (RSLogix5000 .ACD file of DVD or USB flash Drive) as well as in PDF format as explained below.

2. For each controller, submit the following using the controller manufacturer's built in printing functions. Electronic submission of Adobe Portable Document Format ("pdf") files in lieu of paper submittals is acceptable. Review will be for general program organization, level of documentation, and overall programming standards (basic pump and valve control, for example). The review will not attempt to confirm the logic works correctly for every loop.
 - a. PLC programs showing ladder logic, function block, high level language or other controller language used. Include individual rung, network, and/or command descriptions with abundant comments to clearly identify function and intent of each code segment. Each logic segment shall be clearly presented, the function of each timer described, the purpose of each subroutine call labeled and defined, etc. Program documentation shall be sufficiently clear to allow determination of compliance with the process control requirements included in the control descriptions and with the Drawings. The submittal shall demonstrate that all logic provided under this project follows the same structure and format and reflects a common programming approach.
 - b. Submit a memory usage report for the controller. This report shall indicate total memory capacity and unused memory capacity.
 - c. Submit cross reference index of I/O allocation and controller memory address. Every physical I/O point as well calculated or virtual I/O required for the implementation of the process scheme shall be included.
3. Submit details of control system communication. Submit a "memory map" or other means showing which signals are exchanged between PLCs. Also submit a HMI tag database showing all signals exchanged between the PLCs and HMI. Any specific communication block memory addresses shall be defined.

M. Operations and Maintenance (O&M) Manuals:

1. Submit in accordance with Section 01730.
2. Furnish O&M manuals as specified herein. If the PCSS is performing the AE work, provide AE Manuals as specified in Section 13306.
3. The operations and maintenance manuals shall, at a minimum, contain the following information:
 - a. Table of Contents:
 - 1) A Table of Contents shall be provided for the entire manual with the specific contents of each volume clearly listed. The complete Table of Contents shall appear in each volume.
 - b. Instrument and Equipment Lists:
 - 1) The following lists shall be developed in Microsoft Excel format and provided not only as a hardcopy in O&M but also electronically on a CD.
 - 2) An instrument list for all devices supplied including tag number, description, specification section and paragraph number, manufacturer, model number, serial number, range, span, location, manufacturer phone number, local supplier name, local supplier phone number, completion year replacement cost, and any other pertinent data.
 - 3) An equipment list for all non-instrument devices supplied listing description, specification section and paragraph number, manufacturer, model number, serial number, location, manufacturer phone number, local supplier name, local supplier phone number, completion year replacement cost, and any other pertinent data.
 - c. Equipment Operations and Maintenance Information:
 - 1) ISA-TR20.00.01-2001(updated in 2004-2006) data sheets shall be provided for all field instruments. For non-field instrumentation devices, provide a cover page for each device, piece of equipment, and OEM software that lists date, specification number, product name, manufacturer, model number, Location(s), and power required. Preferred format for the cover page is ISA-TR20.00.01-2001(updated in 2004-2006), general data sheet; however, other formats will be acceptable provided they contain all required information.
 - 2) Vendor O&M documentation for each device, piece of equipment, or OEM software shall be either new documentation written specifically for this project, or modified standard vendor documentation. All standard vendor documentation furnished shall have all portions that apply clearly indicated with arrows or circles. All portions that do not apply shall be neatly lined out or crossed out. Groups of pages that do not apply at all to the specific model supplied shall be removed.
 - 3) Provide the record documentation of the system audit as specified in Section 13302 - Testing.
 - 4) Include the calibration forms developed as specified in Section 13302 - Testing.
 - d. As-Built Drawings:
 - 1) Complete as-built drawings, including all drawings and diagrams specified in this section under the "Submittals" section. These drawings shall include all termination points on all equipment the system is connected to, including terminal points of equipment not supplied by the PCSS.

- 2) As built documentation shall include information from submittals, as described in this Specification, updated to reflect the as-built system. Errors in or modifications to the system resulting from the Factory and/or Functional Acceptance Tests shall be incorporated in this documentation.
- e. Original Licensed Software:
- 1) Submit original software diskettes or CD-ROMs of all software provided under this Contract. Submit original paper based and electronic documentation for all software provided. Submit license agreement information including serial numbers, license agreements, User Registration Numbers and related information. All software provided under this Contract shall be licensed to the Owner at the time of purchase. Provide media in software sleeves within O&M manual.
- f. Electronic O&M Information:
- 1) In addition to the hard copy of O&M data, provide an electronic version of all equipment manuals and data sheets, along with any software back-up of configuration files, on CDROM or DVD. Electronic documents shall be supplied in Adobe Acrobat format.
 - 2) Provide electronic files for all custom-developed manuals including training manuals. Text shall be supplied in both Microsoft Office format and Adobe Acrobat format.
 - 3) Provide electronic files for all drawings produced. Drawings shall be in AutoCAD ".dwg" format and in Adobe Acrobat format. Drawings shall be provided using the AutoCAD eTransmit feature to bind external references, pen/line styles, fonts, and the drawing file into individual zip files.
 - 4) Each computer system hardware device shall be backed up onto CDROM or DVD after Substantial Completion and shall be turned over to the Owner.
 - 5) If specified in the training section, provide digital copies of all training videos. Videos shall be in a format that is readable by standard DVD players and by standard PC DVD drives. Format shall be a minimum of 800 by 600 pixels and shall include sound.
- g. Software Maintenance Manual:
- 1) Software Listings and Databases- Submit hard copies of the same information required in the "Controller Program Submittal" except include files updated to reflect the as built system. Include PDF and RSLogix5000 ACD versions of these files on the CD specified below.
 - 2) PID Loop Tuning Parameters - Submit annotated chart recorder traces or computer system trend screen printouts showing tuned control loop response to plus and minus 40 percent of full span step changes of loop setpoint for each individual loop. For cascade loops, submit charts showing response of the secondary loop with secondary setpoint on manual and also response of the entire cascade control loop in automatic mode. Include a description of tuning methodology used.
 - 3) Machine Readable Documentation - Provide two sets of as built software documentation on CD-ROMs in original electronic format for all PLC, HMI systems, reporting systems, Historian Systems, and any other programs developed under this Contract. All changes made during or after testing, start-up, and commissioning shall be incorporated.

4. The cover and edge of each volume shall contain the information as specified in Section 01730.

N. Operator Manuals

1. Provide Operator's Manuals prior to final acceptance of the system.
2. These manuals shall be separately bound and shall contain all information necessary for the operator to monitor and control the plant from the control system. The manuals shall be written in non-technical terms and shall be organized for quick access to each detailed description of the operator's procedure. Manuals shall contain, but not be limited to, the following information:
 - a. A comprehensive table of contents of the manual.
 - b. A simple overview of the entire system indicating the function and purpose of each piece of equipment.
 - c. A detailed description of the operation of the HMI and OIT including all appropriate displays. Including a screenshot of each HMI and OIT display screen and annotating each function in text is an acceptable format for presenting this information.
 - d. Step-by-step procedures for starting up or shutting down an individual component of the control system and also of the entire system.
 - e. Login / logout procedures.
 - f. Complete, step-by-step procedures for printing reports and entering manual data.
 - g. Complete, step-by-step procedures for performing system or selected file backup and restoration including archiving historical data. Include recommended archiving schedule for historical data.
 - h. Operational description for operating HMI computer equipment and peripherals including printers, CD-ROMs, removable bulk storage devices, UPS, etc. Description shall include procedures for typical maintenance and troubleshooting tasks.
 - i. A complete glossary of terms and definition of acronyms.
 - j. List of personnel to be contacted for warranty and emergency services, including name, address, telephone number, pager or cell phone number, fax number, and email address

1.04 COORDINATION MEETINGS

- A. Schedule the mandatory coordination meetings as described herein. The meetings shall be held at the Owner's designated location and shall include attendance by the Owner, the Engineer, the Contractor, and the PCSS's Project Engineer. Other Division 13 specifications may require additional meetings. Prepare and distribute an agenda for this meeting a minimum of one week before the scheduled meeting date. Meeting shall be scheduled a minimum of one week before the requested meeting date.
 1. A project kickoff coordination meeting shall be held within two weeks after submitting the Project Plan. The purpose of the meeting shall be to discuss the PCSS's Project Plan, to summarize the PCSS's understanding of the project; discuss any proposed substitutions or alternatives; schedule testing and delivery deadline dates; provide a forum to coordinate hardware and software related issues; and request any additional information required from the Owner. The meeting will last up to one business day.
 2. Regular on-site meetings when the PCSS staff is at the plant site.

3. Additional meetings required by Section 13306.

1.05 REFERENCE STANDARDS

- A. Publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition in effect at the time of bid opening shall apply.
- B. International Society of Automation (ISA):
 1. ISA S5.2, Binary Logic Diagrams for Process Operations.
 2. ISA S5.3, Graphic Symbols for Distributed Control/Shared Display Instrumentation Logic and Computer Systems.
 3. ISA S5.4, Instrument Loop Diagrams.
 4. ISA S20, Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.
 5. ISA RP60.3, Human Engineering for Control Centers.
 6. ISA RP60.6, Nameplates, Labels, and Tags for Control Centers.
 7. ISA-99, Industrial Automation and Control Systems Security.
- C. National Electrical Manufacturers Association (NEMA).
- D. National Fire Protection Agency (NFPA):
 1. NFPA 70, National Electrical Code (NEC).
 2. NFPA 79, Industrial Control Equipment.
- E. Underwriters Laboratories, Inc. (UL):
 1. UL 508 - Industrial Control Equipment - for custom fabricated equipment.
 2. A nationally recognized testing laboratory, as approved by the Authority having jurisdiction, may substitute for UL listing on commercial off the shelf products.

1.06 QUALITY ASSURANCE

- A. The Process Control System Supplier (PCSS) shall be a "systems integrator" regularly engaged in the design and the installation of instrumentation systems and their associated subsystems as they are applied to the municipal water and wastewater industry. For the purposes of this Specification Section, a "systems integrator" shall be interpreted to mean an organization that complies with all of the following criteria:
 1. Employs personnel on this project who have successfully completed ISA or manufacturers training courses on general process instrumentation and configuration and implementation

of the specific programmable controllers, computers, and software proposed for this project. Key personnel shall hold ISA CCST Level 1 certification or have a minimum of 10 years of verifiable plant startup experience. Key personnel shall include, as a minimum, the lead field technician.

2. Has successfully completed work of similar or greater complexity on at least three previous projects within the last five years. Successful completion shall be defined as a finished project completed on time, without any outstanding claims or litigation involving the PCSS. Potential references shall be for projects where the PCSS's contract was of similar size to this project.
 3. Has been actively engaged in the type of work specified in this Section for a minimum of five years.
- B. The PCSS shall maintain a permanent, fully staffed and equipped service facility within 200 miles of the project site with full time employees capable of designing, fabricating, installing, calibrating, and testing the systems specified herein. At a minimum, the PCSS shall be capable of responding to on-site problems within 12 hours of notice. Provide an on-site response within 4 hours of notification starting at two months before scheduled startup to two months after startup completion.
- C. PCSS shall hold a valid UL-508 certification for their panel fabrication facility.
- D. Actual installation of the instrumentation system need not be performed by the PCSS's employees; however, the PCSS as a minimum shall be responsible for the technical supervision of the installation by providing on site supervision to the installers of the various components.
- E. The selected PCSS shall be one of the following:
1. AdvanTech Corporation - Fairfield, NJ - (973) 808-8550
 2. Aaron Associates - Waterbury, CT - Carmen Corvigno - (203) 753-1536
 3. PCS Integrators- Fairfield NJ - Vinnie Tabone - (973) 575-7464
 4. Optimum Controls Corporation - Reading, PA -- Bazie Azar - (610) 375-0990
 5. or equal.
- F. Being listed in this specification does not relieve any potential PCSS from meeting the qualifications specified in this Section.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Delivery, storage, and handling shall be in accordance with Section 01600.
- B. Shipping Precautions:

1. After completion of shop assembly, factory test and approval of all equipment, cabinets, panels and consoles shall be packed in protective crates and enclosed in heavy duty (5 mil) polyethylene envelopes or secured sheeting to provide protection from damage, dust and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weights shall be shown on shipping tags together with instructions for unloading, transporting, storing and handling at the job site.
2. Manufacturer's special instructions for field handling, storage and installation required for protection, shall be securely attached to the packaging for each piece of equipment prior to shipment. The instructions shall be stored in resealable plastic bags or other means of protection.
3. None of the HMI control and monitoring equipment shall be shipped to the site until the control room areas comply with specified ambient temperature and humidity. Have qualified personnel accept the equipment on delivery and supervise unloading within the control room areas.
4. If any apparatus has been damaged, such damage shall be repaired at no additional cost to the Owner.

1.08 NOMENCLATURE AND IDENTIFICATION

A. Field Instrument Tags:

1. See Section 13340.

B. Panel Nameplates:

1. See Section 13330.

1.09 WARRANTY

- ##### A. Provide warranty per Section 01740, Warranties and Bonds, and as specified herein.

1.10 PROJECT/SITE REQUIREMENTS

- ##### A. Environmental Requirements. Refer to Section 16000 and Electrical Drawings for specific environmental and hazardous area classifications.
- ##### B. Elevation: Equipment shall be designed to operate at the project ground elevation.
- ##### C. Temperature:
1. Outdoor areas' equipment shall operate between -30 to 50 C degrees ambient
 2. Equipment located in indoor locations shall operate between 10 to 35 C degrees ambient minimum.
 3. Storage temperatures shall range from 0 to 50 C degrees ambient minimum.

4. Additional cooling or heating shall be furnished if required by the equipment as specified herein.
- D. Relative Humidity. Air conditioned area equipment shall operate between 20 to 95 percent relative, non-condensing humidity. All other equipment shall operate between 5 to 100 percent relative, condensing humidity.

PART 2 PRODUCTS

2.01 GENERAL

- A. All instrumentation and electronic equipment shall be of the manufacturer's latest design, utilizing printed circuitry and epoxy or equal coating to prevent contamination by dust, moisture and fungus. The field mounted equipment and system components shall be designed for installation in dusty, humid and slightly corrosive service conditions.
- B. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks unless otherwise noted. Fasteners for securing control panels and enclosures to walls and floors shall be either hot-dipped galvanized after fabrication or stainless steel. Provide stainless steel fasteners only in corrosive areas rated NEMA 4X on the Drawings. Provide minimum size anchor of 3/8-inch.
- C. All indicators shall be linear in process units, unless otherwise noted. All transmitters shall be provided with indicators in process units, accurate to two percent or better.
- D. All equipment, cabinets and devices furnished shall be heavy-duty type, designed for continuous industrial service. The system shall contain similar products of a single manufacturer, and shall consist of equipment models, which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion.
- E. All electronic/digital equipment shall be provided with radio frequency interference protection.
- F. Electrical:
 1. Equipment shall operate on a 60 Hertz alternating current power source at a nominal 120 volts, plus or minus 10 percent, except where specifically noted. Regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.
 2. With the exception for field device network connected devices, all electronic instrumentation shall utilize linear transmission signals of isolated 4 to 20 mA DC (milliampere direct current) capable of driving a load up to 750 ohms, unless specified otherwise. However, signals between instruments within the same panel or cabinet may be 1-5 VDC (volts direct current).
 3. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero based signals will be allowed.

4. All switches shall have double-pole, double-throw contacts rated at a minimum of 600 VA, unless noted otherwise.
5. Switches and/or signals indicating an alarm, failure or upset condition shall be wired in a fail-safe manner. A fail-safe condition is an open circuit when in an alarm state.
6. Materials and equipment shall be UL approved whenever such approved equipment and materials are available.
7. All equipment furnished shall be designed and constructed so that in the event of power interruption, the systems specified herein shall go through an orderly shutdown with no loss of memory, and shall resume normal operation without manual resetting when power is restored, unless otherwise noted.

2.02 ELECTRICAL SURGE PROTECTION

- A. General - Surge protection shall be provided to protect the electronic instrumentation system from induced surges propagating along the signal and power supply lines from lightning, utility, or the plant electrical system. The protection systems shall be such that the protective level shall not interfere with normal operation, but shall be lower than the instrument surge withstand level. Protection shall be maintenance free and self-restoring. Devices shall have a response time of less than 50 nanoseconds and be capable of handling a discharge surge current (at an 8x20 μ s impulse waveform) of at least 8 kA. Ground wires for all instrumentation device surge protectors shall be connected to a low resistance ground in accordance with Section 16660.
- B. Provide protection of all analog signal (4-20 mA) circuits where any part of the circuit is outside of the building envelope. Circuits shall be protected at both the transmitter and the control system end of the circuit. Protection devices located near the transmitter shall be mounted in a separate NEMA 4X stainless steel enclosure (plastic is not acceptable) or conduit mounted, and shall be Phoenix Contact PT Series, MTL Surge Technologies (Telematic) TP48, Citel TSP-10 series, or equal. Substitution of a single device to protect both 120 VAC and 4-20 mA wires to an instrument is acceptable. Protection devices in control panels shall be MTL Surge Technologies (Telematic) SD Series, Phoenix Contact PT Series, Citel DLA series, or equal.
- C. Provide protection of all 120 VAC power feeds into control panels, instruments, and control room equipment. Surge arresters shall be Transtector ACP-100BW Series, Phoenix Contact "Mains-PlugTrab", MCG Surge Protection 400 Series, Citel DS40 series, or equal.
- D. Non-Fiber Based Data Highway or Communications Circuits - Provide protection on all communication and data highway circuits that leave a building or are routed external to a building. Circuit protection shall be provided at both ends of the line. Surge protection devices shall be Phoenix Contact PlugTrab Series, Transtector FSP Series, MTL Surge Technologies (Telematic) NP Series, Citel DLA series or MJ8 series, or equal.
- E. RF Coaxial Cable - Provide protection on communication cables between radios and antennas, mounted either inside the panel, or in the wall of the enclosure in accordance with NEMA and UL standards. Surge protection devices shall be Citel P8AX series, Polyphaser, or equal.

- F. Inductive Loads - Provide coil surge suppression devices, such as varistors or interposing relays, on all process controller outputs or switches rated 120 VA or less that drive solenoid, coil, or motor loads.
- G. Telephone Circuits - At a minimum, provide Telephone Company approved line protection units for all telephone lines used for telemetry or SCADA system use under this Contract.

2.03 WIRES AND CONNECTORS

- A. Ethernet 10/100/1000 BASE-T/TX Cable.
 - 1. The unshielded twisted pair cable shall be designed for use with a high speed (10/100/1000 Mbps) Ethernet 10/100/1000 BASE-T/TX communications network. The twisted pair cable shall have a nominal impedance 100 ohms at one MHz, a maximum attenuation of 8 dB per 1000 feet at one MHz. The twisted pair cable must have frequency tested up to 250 MHz or more. The twisted pair cable shall be plenum rated and shall have a minimum of four 23 AWG solid copper conductor pairs. All 10/100/1000 BASE-T/TX (RJ-45) terminations on the twisted pair cable shall be done in a professional and workman like manner. Terminations shall provide for proper strain relief on the cable jacket. Strain relief on the wire and/or wire insulation shall not be acceptable.

2.04 SPARE PARTS

- A. All spare parts shall be wrapped in bubble wrap, sealed in a polyethylene bag complete with dehumidifier, then packed in cartons and labeled with indelible markings. Complete ordering information including manufacturer's contact information (address and phone number), part name, part number, part ordering information, and equipment name and number(s) for which the part is to be used shall be supplied with the required spare parts. The spare parts shall be delivered and stored in a location directed by the Owner or Engineer.
- B. Furnish one of each type of installed Surge protection devices.
- C. Other spare parts are specified in each section. An overview follows:
 - 1. Devices within Control Panels - See the control panels section.
 - 2. Computer Hardware and Software spare parts - See the Computer System Hardware section.
 - 3. PLC spare parts - See the PLC section.
 - 4. Network and Communications System - See the Control and Data Network Equipment section.
 - 5. Instrument related Spare Parts - see the Instrument section(s).

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

- A. Instrumentation and accessory equipment shall be installed in accordance with manufacturer instructions. The indicated locations of equipment, transmitters, alarms and similar devices indicated are approximate only. Exact locations of all devices shall be as approved by the Engineer during construction. Obtain in the field, all information relevant to the placing of process control equipment and in case of interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner at no additional cost to the Owner.
- B. Provide brackets and hangers required for mounting of equipment.
- C. The shield on each process instrumentation cable shall be continuous from source to destination and be grounded at only one ground point for each shield.
- D. Investigate each space in the building through which equipment must pass to reach its final location. If necessary, ship material in sections sized to permit passing through restricted areas in the building. Provide on-site service to oversee the installation, the placing and location of system components, their connections to the process equipment panels, cabinets and devices, subject to the Engineer's approval. Certify that field wiring associated with the equipment is installed in accordance with best industry practice. Coordinate work under this Section with that of the electrical work specified under applicable sections of Division 16.

3.02 TESTING

- A. Refer to Section 13302.

3.03 TRAINING

- A. Refer to Section 13303.

3.04 DIVISION 13 (PCSS) FIELD INSTRUMENT LIST

- A. Each column of the field instrument list is defined as follows:
 - 1. TAG: The identifier assigned to the field instrument.
 - 2. QUANTITY: The quantity of instruments to be provided.
 - 3. DESCRIPTION: A description of the instrument.
 - 4. FUNCTION: The process being measured.
 - 5. TYPE: The type of instrument to be provided. For example, if the instrument is a flowmeter, this will specify whether it is a magnetic flowmeter, propeller flowmeter, etc. Special criteria will also be included in this column, such as quantity of alarm contacts needed, etc.

6. SHEET: The P&ID or drawing where the I/O point appears on.
7. RANGE/SETTING: Required instrument range or switch setting.
8. SPEC: The Division 13 specification section number where the instrument details can be found.

B. Instruments shall be furnished per the requirements of the following field instrument list.

TAG	QTY	DESCRIPTION	FUNCTION	TYPE	SHEET	RANGE/ SETTING	SPEC
FSL-511, 512, 513, 514	4	Flow Switch	Waste Activated Sludge Pump – Seal Water Low Flow	Float Measuring Principle	I-4	0.5 GPM	13341
PI-511A, 512A, 513A, 514A	4	Pressure Gauge	WAS Pump Suction Pressure	Bourdon Tube Pressure Gauge with threaded diaphragm seal and shutoff valve	I-4	-30" -15 PSI	13343
PI-511B, 512B, 513B, 514B	4	Pressure Gauge	WAS Pump Discharge Pressure	Bourdon Tube Pressure Gauge with threaded diaphragm seal and shutoff valve	I-4	0-100 PSI	13343
PI-511C, 512C, 513C, 514C	4	Pressure Gauge	Seal Water Pressure	Bourdon Tube Pressure Gauge with threaded diaphragm seal and shutoff valve	I-4	0-100 PSI	13343
PIT-520	1	Pressure Transmitter	WAS Discharge Pressure	Continuous Pressure Monitor with threaded diaphragm seal and shutoff valve	I-4	0-100 PSI	13343
FE/FIT- 520	1	Flow Transmitter	WAS Discharge Flow	Magnetic Flowmeter	I-4	0-20 MGD	13341

APPENDIX 13300-A

EXISTING PROGRAMMABLE LOGIC CONTROLLER INPUT/OUTPUT (I/O) SCHEDULE

This existing programmable logic controller (PLC) I/O schedule is a list of the existing inputs and outputs for the Allen-Bradley PLC-5 and associated Remote I/O (RIO) racks being replaced under this contract. All hardwired signals shown must be wired to the new PLC-RASWAS being furnished under this project. Additional hardwired signals are indicated on the P&IDs.

The highlighted signals included on the list are not hardwired – they communicate from the VFDs to the existing PLC via RIO protocol. The communication shall be modified such that these highlighted signals communicate from the VFDs to the new PLC-RASWAS via Ethernet/IP protocol.

The PCSS shall program control logic for these signals in the new PLC-RASWAS. With the exception of new control requirements defined in Sections 13305 and 13306, the new PLC shall perform the same functionality as the existing PLC from where the signal was removed. Existing PLC programs can be obtained from the Owner after the contract is awarded.

END OF SECTION

Appendix 13300-A
Existing RAS/WAS PLC I/O List

Chassis	Chassis Type	Module Type	I/O Type	I/O Points	Address	Rack	Slot	Point	Description
1 / 2	1771-A3B (12 slots)	1771-ICD	DI	16	I:010/0	1	0	0	SPARE
			DI		I:010/1	1	0	1	TEMP RAS PUMP #1 ALARM
			DI		I:010/2	1	0	2	TEMP RAS PUMP #2 ALARM
			DI		I:010/3	1	0	3	TEMP RAS PUMP #3 ALARM
			DI		I:010/4	1	0	4	TEMP RAS PUMP #4 ALARM
			DI		I:010/5	1	0	5	TEMP RAS PUMP #5 ALARM
			DI		I:010/6	1	0	6	TEMP RAS PUMP #6 ALARM
			DI		I:010/7	1	0	7	TEMP RAS PUMP #7 ALARM
			DI		I:010/10	1	0	8	TEMP RAS PUMP #8 ALARM
			DI		I:010/11	1	0	9	TEMP RAS PUMP #9 ALARM
			DI		I:010/12	1	0	10	SPARE
			DI		I:010/13	1	0	11	SPARE
			DI		I:010/14	1	0	12	SPARE
			DI		I:010/15	1	0	13	SPARE
			DI		I:010/16	1	0	14	SPARE
			DI		I:010/17	1	0	15	SPARE
			1 / 2		1771-A3B (12 slots)	1771-ICD	DI	16	I:011/0
DI	I:011/1	1		1			1		SLUICE GATE SG501 SLUDGE WITHDRAWAL CLOSED
DI	I:011/2	1		1			2		SLUICE GATE SLUDGE WITHDRAWAL OPERATOR RUN
DI	I:011/3	1		1			3		SLUICE GATE SLUDGE WITHDRAWAL OPERATOR OVERLOAD
DI	I:011/4	1		1			4		RAS/WAS INFLUENT WELL HIGH LEVEL
DI	I:011/5	1		1			5		RAS/WAS INFLUENT WELL LOW LEVEL ALARM
DI	I:011/6	1		1			6		SLUICE GATE SG502 SLUDGE WITHDRAWAL OPEN
DI	I:011/7	1		1			7		SLUICE GATE SG502 SLUDGE WITHDRAWAL CLOSED
DI	I:011/10	1		1			8		SLUICE GATE SLUDGE WITHDRAWAL OPERATOR RUN
DI	I:011/11	1		1			9		SLUICE GATE SLUDGE WITHDRAWAL OPERATOR OVERLOAD
DI	I:011/12	1		1			10		SLUICE GATE SG520 RETURN SLUDGE OPEN
DI	I:011/13	1		1			11		SLUICE GATE SG520 RETURN SLUDGE CLOSED
DI	I:011/14	1		1			12		SLUICE GATE RETURN SLUDGE OPERATOR RUN
DI	I:011/15	1		1			13		SLUICE GATE RETURN SLUDGE OPERATOR OVERLOAD
DI	I:011/16	1		1			14		SLUICE GATE SG521 RETURN SLUDGE OPEN
DI	I:011/17	1		1			15		SLUICE GATE SG521 RETURN SLUDGE CLOSED

Appendix 13300-A
Existing RAS/WAS PLC I/O List

Chassis	Chassis Type	Module Type	I/O Type	I/O Points	Address	Rack	Slot	Point	Description
1 / 2	1771-A3B (12 slots)	1771-ICD	DI	16	I:012/0	1	2	0	SLUICE GATE SG521 RETURN SLUDGE OPERATOR RUN
			DI		I:012/1	1	2	1	SLUICE GATE SG521 RETURN SLUDGE OPERATOR OVERLOAD
			DI		I:012/2	1	2	2	RETURN SLUDGE PUMP #1 RUN
			DI		I:012/3	1	2	3	RETURN SLUDGE PUMP #1 OVERLOAD
			DI		I:012/4	1	2	4	RETURN SLUDGE PUMP #1 AUXILARY PRELUBE OIL PUMP #1 RUN
			DI		I:012/5	1	2	5	RETURN SLUDGE PUMP #1 SYSTEM FAIL - FAILSAFE CONTACT
			DI		I:012/6	1	2	6	RETURN SLUDGE PUMP #2 RUN
			DI		I:012/7	1	2	7	RETURN SLUDGE PUMP #2 OVERLOAD
			DI		I:012/10	1	2	8	RETURN SLUDGE PUMP #2 AUXILARY PRELUBE OIL PUMP #2 RUN
			DI		I:012/11	1	2	9	RETURN SLUDGE PUMP #2 SYSTEM FAIL
			DI		I:012/12	1	2	10	RETURN SLUDGE PUMP #3 RUN
			DI		I:012/13	1	2	11	RETURN SLUDGE PUMP #3 OVERLOAD
			DI		I:012/14	1	2	12	RETURN SLUDGE PUMP #3 AUXILARY PRELUBE OIL PUMP #3 RUN
			DI		I:012/15	1	2	13	RETURN SLUDGE PUMP #3 SYSTEM FAIL
			DI		I:012/16	1	2	14	AUTO TEMPERATURE CONTROLLER #6 ALARM
			DI		I:012/17	1	2	15	AUTO TEMPERATURE CONTROLLER #7 ALARM
			1 / 2		1771-A3B (12 slots)	1771-ICD	DI	16	I:013/0
DI	I:013/1	1		3			1		RWS 4160V SWGR - 1D BUS - A ACB 1DA1 CLOSED
DI	I:013/2	1		3			2		RWS 4160V SWGR - 1D BUS - A ACB 1DA1 OPEN
DI	I:013/3	1		3			3		RWS 4160V SWGR - 1D BUS - A ACB 1DA1 OVERLOAD
DI	I:013/4	1		3			4		RWS 4160V SWGR - 1D BUS - A ACB 1DA2 CLOSED
DI	I:013/5	1		3			5		RWS 4160V SWGR - 1D BUS - A ACB 1DA2 OPEN
DI	I:013/6	1		3			6		RWS 4160V SWGR - 1D BUS - A ACB 1DA2 OVERLOAD
DI	I:013/7	1		3			7		RWS 4160V SWGR - 1D TIE ACB 1DT CLOSED
DI	I:013/10	1		3			8		RWS 4160V SWGR - 1D TIE ACB 1DT OPEN
DI	I:013/11	1		3			9		RWS 4160V SWGR - 1D TIE ACB 1DT OVERLOAD
DI	I:013/12	1		3			10		RWS 4160V SWGR - 1D BUS - B ACB 1DB1 CLOSED
DI	I:013/13	1		3			11		RWS 4160V SWGR - 1D BUS - B ACB 1DB1 OPEN
DI	I:013/14	1		3			12		RWS 4160V SWGR - 1D BUS - B ACB 1DB1 OVERLOAD
DI	I:013/15	1		3			13		RWS 4160V SWGR - 1D BUS - B ACB 1DB2 CLOSED
DI	I:013/16	1		3			14		RWS 4160V SWGR - 1D BUS - B ACB 1DB2 OPEN
DI	I:013/17	1		3			15		RWS 4160V SWGR - 1D BUS - B ACB 1DB2 OVERLOAD

Appendix 13300-A
Existing RAS/WAS PLC I/O List

Chassis	Chassis Type	Module Type	I/O Type	I/O Points	Address	Rack	Slot	Point	Description
1 / 2	1771-A3B (12 slots)	1771-ICD	DI	16	I:014/0	1	4	0	AUTO TEMPERATURE CONTROLLER #8 ALARM
			DI		I:014/1	1	4	1	AIR HANDLING UNIT HV-3 RUN
			DI		I:014/2	1	4	2	AIR HANDLING UNIT HV-3 OVERLOAD
			DI		I:014/3	1	4	3	RAS STATION COMMON ALARM FROM EXISTING ANNUNCIATOR
			DI		I:014/4	1	4	4	SPARE
			DI		I:014/5	1	4	5	SPARE
			DI		I:014/6	1	4	6	SPARE
			DI		I:014/7	1	4	7	SPARE
			DI		I:014/10	1	4	8	SPARE
			DI		I:014/11	1	4	9	SPARE
			DI		I:014/12	1	4	10	SPARE
			DI		I:014/13	1	4	11	SPARE
			DI		I:014/14	1	4	12	SPARE
			DI		I:014/15	1	4	13	SPARE
			DI		I:014/16	1	4	14	SPARE
			DI		I:014/17	1	4	15	SPARE
			1 / 2		1771-A3B (12 slots)	1771-ICD	DI	16	I:015/0
DI	I:015/1	1		5			1		SPARE
DI	I:015/2	1		5			2		SPARE
DI	I:015/3	1		5			3		SPARE
DI	I:015/4	1		5			4		SPARE
DI	I:015/5	1		5			5		SPARE
DI	I:015/6	1		5			6		SPARE
DI	I:015/7	1		5			7		SPARE
DI	I:015/10	1		5			8		SPARE
DI	I:015/11	1		5			9		SPARE
DI	I:015/12	1		5			10		SPARE
DI	I:015/13	1		5			11		SPARE
DI	I:015/14	1		5			12		SPARE
DI	I:015/15	1		5			13		SPARE
DI	I:015/16	1		5			14		SPARE
DI	I:015/17	1		5			15		SPARE
1 / 2	1771-A3B (12 slots)	BLANK		N/A			BLANK		BLANK
1 / 2		BLANK	N/A	BLANK	BLANK	1	7	N/A	BLANK MODULE
1 / 2	1771-A3B (12 slots)	1771-NIV/C (High Resolution I/O Module)	AI	8	N10:5	2	0	0	WAS PUMPING RATE FROM FLOW METER W/IMPL DEC OF 2
			AI		N10:7	2	0	1	SWITCHGEAR 1D BUS "A" POWER JY530 RELAY 0-1400 kw RAW IS 0-1
			AI		N10:9	2	0	2	SWITCHGEAR 1D BUS "B" JY531 POWER RELAY 0-1400kw RAW IS 0-14
			AI		N10:11	2	0	3	SLUICE GATE SGRS-520 GATE OPEN POSITION 0-100%
			AI		N10:13	2	0	4	SLUICE GATE SGRS-521 GATE OPEN POSITION 0-100%
			AI		N10:15	2	0	5	RAS/WAS WET WELL LEVEL 0-1000 FEET W/IMPL DEC OF 1 FOR 0-10
			AI		N10:17	2	0	6	SPARE
			AI		N10:19	2	0	7	SPARE

Appendix 13300-A
Existing RAS/WAS PLC I/O List

Chassis	Chassis Type	Module Type	I/O Type	I/O Points	Address	Rack	Slot	Point	Description
1 / 2	1771-A3B (12 slots)	BLANK	N/A	BLANK	BLANK	2	1	N/A	BLANK MODULE
1 / 2		BLANK	N/A	BLANK	BLANK	2	2	N/A	BLANK MODULE
1 / 2		BLANK	N/A	BLANK	BLANK	2	3	N/A	BLANK MODULE
3 / 4	1771-A3B (12 slots)	1771-IAD	DI	16	I:030/0	3	0	0	RAS PUMP #1 SPRAY WATER CYCLE COMPLETE
			DI		I:030/1	3	0	1	RAS PUMP #2 SPRAY WATER CYCLE COMPLETE
			DI		I:030/2	3	0	2	RAS PUMP #3 SPRAY WATER CYCLE COMPLETE
			DI		I:030/3	3	0	3	RAS PUMP #1 SPRAY WATER ON AND TIMING
			DI		I:030/4	3	0	4	RAS PUMP #2 SPRAY WATER ON AND TIMING
			DI		I:030/5	3	0	5	RAS PUMP #3 SPRAY WATER ON AND TIMING
			DI		I:030/6	3	0	6	SPARE
			DI		I:030/7	3	0	7	SPARE
			DI		I:030/10	3	0	8	SPARE
			DI		I:030/11	3	0	9	SPARE
			DI		I:030/12	3	0	10	SPARE
			DI		I:030/13	3	0	11	SPARE
			DI		I:030/14	3	0	12	SPARE
			DI		I:030/15	3	0	13	SPARE
			DI		I:030/16	3	0	14	SPARE
			DI		I:030/17	3	0	15	SPARE
			3 / 4		1771-A3B (12 slots)	1771-IAD	DI	16	I:031/0
DI	I:031/1	3		1			1		SPARE
DI	I:031/2	3		1			2		SPARE
DI	I:031/3	3		1			3		SPARE
DI	I:031/4	3		1			4		SPARE
DI	I:031/5	3		1			5		SPARE
DI	I:031/6	3		1			6		SPARE
DI	I:031/7	3		1			7		SPARE
DI	I:031/10	3		1			8		SPARE
DI	I:031/11	3		1			9		SPARE
DI	I:031/12	3		1			10		SPARE
DI	I:031/13	3		1			11		SPARE
DI	I:031/14	3		1			12		SPARE
DI	I:031/15	3		1			13		SPARE
DI	I:031/16	3		1			14		SPARE
DI	I:031/17	3		1			15		SPARE

Appendix 13300-A
Existing RAS/WAS PLC I/O List

Chassis	Chassis Type	Module Type	I/O Type	I/O Points	Address	Rack	Slot	Point	Description
3 / 4	1771-A3B (12 slots)	1771-OAD	DO	16	O:032/0	3	2	0	RAS #1 STOP
			DO		O:032/1	3	2	1	RAS #1 START
			DO		O:032/2	3	2	2	RAS #2 STOP
			DO		O:032/3	3	2	3	RAS #2 START
			DO		O:032/4	3	2	4	RAS #3 STOP
			DO		O:032/5	3	2	5	RAS #3 START
			DO		O:032/6	3	2	6	SPARE
			DO		O:032/7	3	2	7	SPARE
			DO		O:032/10	3	2	8	SPARE
			DO		O:032/11	3	2	9	SPARE
			DO		O:032/12	3	2	10	SPARE
			DO		O:032/13	3	2	11	SPARE
			DO		O:032/14	3	2	12	SPARE
			DO		O:032/15	3	2	13	SPARE
			DO		O:032/16	3	2	14	SPARE
			DO		O:032/17	3	2	15	SPARE
			3 / 4		1771-A3B (12 slots)	BLANK	N/A	BLANK	BLANK
3 / 4	BLANK	N/A	BLANK	BLANK		3	4	N/A	BLANK MODULE
3 / 4	BLANK	N/A	BLANK	BLANK		3	5	N/A	BLANK MODULE
3 / 4	BLANK	N/A	BLANK	BLANK		3	6	N/A	BLANK MODULE
3 / 4	BLANK	N/A	BLANK	BLANK		3	7	N/A	BLANK MODULE
3 / 4	BLANK	N/A	BLANK	BLANK		4	0	N/A	BLANK MODULE
3 / 4	BLANK	N/A	BLANK	BLANK		4	1	N/A	BLANK MODULE
3 / 4	BLANK	N/A	BLANK	BLANK		4	2	N/A	BLANK MODULE
3 / 4	BLANK	N/A	BLANK	BLANK		4	3	N/A	BLANK MODULE
5 / 6	1771-A3B (12 slots)	1771-IAD	DI	16	I:050/0	5	0	0	WASTE PUMP #1 AUTOMATIC DISCHARGE VALVE #1 CLOSE LIMIT SWTCH
			DI		I:050/1	5	0	1	WASTE PUMP #1 AUTOMATIC DISCHARGE VALVE #1 OPEN LIMIT SWTCH
			DI		I:050/2	5	0	2	WASTE PUMP #1 AUTOMATIC DISCHARGE VALVE #1 OVERLOAD
			DI		I:050/3	5	0	3	WASTE PUMP #1 AUTOMATIC DISCHARGE VALVE #1 RUNNING
			DI		I:050/4	5	0	4	SPARE
			DI		I:050/5	5	0	5	SPARE
			DI		I:050/6	5	0	6	SPARE
			DI		I:050/7	5	0	7	SPARE
			DI		I:050/10	5	0	8	SPARE
			DI		I:050/11	5	0	9	SPARE
			DI		I:050/12	5	0	10	SPARE
			DI		I:050/13	5	0	11	SPARE
			DI		I:050/14	5	0	12	SPARE
			DI		I:050/15	5	0	13	SPARE
			DI		I:050/16	5	0	14	SPARE
			DI		I:050/17	5	0	15	SPARE

Appendix 13300-A
Existing RAS/WAS PLC I/O List

Chassis	Chassis Type	Module Type	I/O Type	I/O Points	Address	Rack	Slot	Point	Description
5 / 6	1771-A3B (12 slots)	1771-IAD	DI	16	I:051/0	5	1	0	WASTE PUMP #2 AUTOMATIC DISCHARGE VALVE #2 CLOSE LIMIT SWTCH
			DI		I:051/1	5	1	1	WASTE PUMP #2 AUTOMATIC DISCHARGE VALVE #2 OPEN LIMIT SWTCH
			DI		I:051/2	5	1	2	WASTE PUMP #2 AUTOMATIC DISCHARGE VALVE #2 OVERLOAD
			DI		I:051/3	5	1	3	WASTE PUMP #2 AUTOMATIC DISCHARGE VALVE #2 RUNNING
			DI		I:051/4	5	1	4	SPARE
			DI		I:051/5	5	1	5	SPARE
			DI		I:051/6	5	1	6	SPARE
			DI		I:051/7	5	1	7	SPARE
			DI		I:051/10	5	1	8	SPARE
			DI		I:051/11	5	1	9	SPARE
			DI		I:051/12	5	1	10	SPARE
			DI		I:051/13	5	1	11	SPARE
			DI		I:051/14	5	1	12	SPARE
			DI		I:051/15	5	1	13	SPARE
			DI		I:051/16	5	1	14	SPARE
			DI		I:051/17	5	1	15	SPARE
			5 / 6		1771-A3B (12 slots)	1771-IAD	DI	16	I:052/0
DI	I:052/1	5		2			1		WASTE PUMP #3 AUTOMATIC DISCHARGE VALVE #3 OPEN LIMIT SWTCH
DI	I:052/2	5		2			2		WASTE PUMP #3 AUTOMATIC DISCHARGE VALVE #3 OVERLOAD
DI	I:052/3	5		2			3		WASTE PUMP #3 AUTOMATIC DISCHARGE VALVE #3 RUNNING
DI	I:052/4	5		2			4		SPARE
DI	I:052/5	5		2			5		SPARE
DI	I:052/6	5		2			6		SPARE
DI	I:052/7	5		2			7		SPARE
DI	I:052/10	5		2			8		SPARE
DI	I:052/11	5		2			9		SPARE
DI	I:052/12	5		2			10		SPARE
DI	I:052/13	5		2			11		SPARE
DI	I:052/14	5		2			12		SPARE
DI	I:052/15	5		2			13		SPARE
DI	I:052/16	5		2			14		SPARE
DI	I:052/17	5		2			15		SPARE

Appendix 13300-A
Existing RAS/WAS PLC I/O List

Chassis	Chassis Type	Module Type	I/O Type	I/O Points	Address	Rack	Slot	Point	Description
5 / 6	1771-A3B (12 slots)	1771-IAD	DI	16	I:053/0	5	3	0	WASTE PUMP #4 AUTOMATIC DISCHARGE VALVE #4 CLOSE LIMIT SWTCH
			DI		I:053/1	5	3	1	WASTE PUMP #4 AUTOMATIC DISCHARGE VALVE #4 OPEN LIMIT SWTCH
			DI		I:053/2	5	3	2	WASTE PUMP #4 AUTOMATIC DISCHARGE VALVE #4 OVERLOAD
			DI		I:053/3	5	3	3	WASTE PUMP #4 AUTOMATIC DISCHARGE VALVE #4 RUNNING
			DI		I:053/4	5	3	4	SPARE
			DI		I:053/5	5	3	5	SPARE
			DI		I:053/6	5	3	6	SPARE
			DI		I:053/7	5	3	7	SPARE
			DI		I:053/10	5	3	8	SPARE
			DI		I:053/11	5	3	9	SPARE
			DI		I:053/12	5	3	10	SPARE
			DI		I:053/13	5	3	11	SPARE
			DI		I:053/14	5	3	12	SPARE
			DI		I:053/15	5	3	13	SPARE
			DI		I:053/16	5	3	14	SPARE
			DI		I:053/17	5	3	15	SPARE
			5 / 6		1771-A3B (12 slots)	1771-ODZ	DO	8	O:054/0
DO	O:054/1	5		4			1		WASTE PUMP #1 AUTOMATIC DISCHARGE VALVE #1 OPEN COIL
DO	O:054/2	5		4			2		WASTE PUMP #2 AUTOMATIC DISCHARGE VALVE #2 CLOSE COIL
DO	O:054/3	5		4			3		WASTE PUMP #2 AUTOMATIC DISCHARGE VALVE #2 OPEN COIL
DO	O:054/4	5		4			4		WASTE PUMP #3 AUTOMATIC DISCHARGE VALVE #3 CLOSE COIL
DO	O:054/5	5		4			5		WASTE PUMP #3 AUTOMATIC DISCHARGE VALVE #3 OPEN COIL
DO	O:054/6	5		4			6		WASTE PUMP #4 AUTOMATIC DISCHARGE VALVE #4 CLOSE COIL
DO	O:054/7	5		4			7		WASTE PUMP #4 AUTOMATIC DISCHARGE VALVE #4 OPEN COIL
5 / 6	1771-A3B (12 slots)	1771-OAD	DO	16	O:055/0	5	5	0	COMMON WASTE PUMP RE TRANS RELAY AR1
			DO		O:055/1	5	5	1	SPARE
			DO		O:055/2	5	5	2	SPARE
			DO		O:055/3	5	5	3	SPARE
			DO		O:055/4	5	5	4	SPARE
			DO		O:055/5	5	5	5	SPARE
			DO		O:055/6	5	5	6	SPARE
			DO		O:055/7	5	5	7	SPARE
			DO		O:055/10	5	5	8	SPARE
			DO		O:055/11	5	5	9	SPARE
			DO		O:055/12	5	5	10	SPARE
			DO		O:055/13	5	5	11	SPARE
			DO		O:055/14	5	5	12	SPARE
			DO		O:055/15	5	5	13	SPARE
			DO		O:055/16	5	5	14	SPARE
			DO		O:055/17	5	5	15	SPARE

Appendix 13300-A
Existing RAS/WAS PLC I/O List

Chassis	Chassis Type	Module Type	I/O Type	I/O Points	Address	Rack	Slot	Point	Description
5 / 6	1771-A3B (12 slots)	1771-OAD	DO	16	O:056/0	5	6	0	SPARE
			DO		O:056/1	5	6	1	SPARE
			DO		O:056/2	5	6	2	SPARE
			DO		O:056/3	5	6	3	SPARE
			DO		O:056/4	5	6	4	SPARE
			DO		O:056/5	5	6	5	SPARE
			DO		O:056/6	5	6	6	SPARE
			DO		O:056/7	5	6	7	SPARE
			DO		O:056/10	5	6	8	SPARE
			DO		O:056/11	5	6	9	SPARE
			DO		O:056/12	5	6	10	SPARE
			DO		O:056/13	5	6	11	SPARE
			DO		O:056/14	5	6	12	SPARE
			DO		O:056/15	5	6	13	SPARE
			DO		O:056/16	5	6	14	SPARE
			DO		O:056/17	5	6	15	SPARE
			5 / 6		1771-A3B (12 slots)	1771-OAD	DO	16	O:057/0
DO	O:057/1	5		7			1		SPARE
DO	O:057/2	5		7			2		SPARE
DO	O:057/3	5		7			3		SPARE
DO	O:057/4	5		7			4		SPARE
DO	O:057/5	5		7			5		SPARE
DO	O:057/6	5		7			6		SPARE
DO	O:057/7	5		7			7		SPARE
DO	O:057/10	5		7			8		SPARE
DO	O:057/11	5		7			9		SPARE
DO	O:057/12	5		7			10		SPARE
DO	O:057/13	5		7			11		SPARE
DO	O:057/14	5		7			12		SPARE
DO	O:057/15	5		7			13		SPARE
DO	O:057/16	5		7			14		SPARE
DO	O:057/17	5		7			15		SPARE
5 / 6	1771-A3B (12 slots)	1771-NOC N Series High Resolution I/O Module		AO			8		N11:1
			AO	N11:2	6	0		1	WASTE PUMP #2 SPEED OUTPUT TO SYCOM
			AO	N11:3	6	0		2	WASTE PUMP #3 SPEED OUTPUT TO SYCOM
			AO	N11:4	6	0		3	WASTE PUMP #4 SPEED OUTPUT TO SYCOM
			AO	N11:5	6	0		4	SPARE
			AO	N11:6	6	0		5	SPARE
			AO	N11:7	6	0		6	SPARE
			AO	N11:8	6	0		7	SPARE
5 / 6	1771-A3B (12 slots)	BLANK	N/A	BLANK	BLANK	6	1	N/A	BLANK MODULE
5 / 6		BLANK	N/A	BLANK	BLANK	6	2	N/A	BLANK MODULE
5 / 6		BLANK	N/A	BLANK	BLANK	6	3	N/A	BLANK MODULE

Appendix 13300-A
Existing RAS/WAS PLC I/O List

Chassis	Chassis Type	Module Type	I/O Type	I/O Points	Address	Rack	Slot	Point	Description
		VFD Communications	DI	16	I:070/0				WASTE PUMP #1 VFD ENABLED
			DI		I:070/1				WASTE PUMP #1 VFD RUNNING
			DI		I:070/2				WASTE PUMP #1 VFD COMMAND DIRECTION
			DI		I:070/3				WASTE PUMP #1 VFD ACTUAL DIRECTION
			DI		I:070/4				WASTE PUMP #1 VFD ACCELERATING
			DI		I:070/5				WASTE PUMP #1 VFD DECELERATING
			DI		I:070/6				WASTE PUMP #1 VFD ALARM
			DI		I:070/7				WASTE PUMP #1 VFD FAULTED
			DI		I:070/10				WASTE PUMP #1 VFD AT SPEED
						VFD Communications	DI	16	I:100/0
DI	I:100/1								WASTE PUMP #2 VFD RUNNING
DI	I:100/2								WASTE PUMP #2 VFD COMMAND DIRECTION
DI	I:100/3								WASTE PUMP #2 VFD ACTUAL DIRECTION
DI	I:100/4								WASTE PUMP #2 VFD ACCELERATING
DI	I:100/5								WASTE PUMP #2 VFD DECELERATING
DI	I:100/6								WASTE PUMP #2 VFD ALARM
DI	I:100/7								WASTE PUMP #2 VFD FAULTED
DI	I:100/10								WASTE PUMP #2 VFD AT SPEED
		VFD Communications		DI			16		I:110/0
			DI	I:110/1					WASTE PUMP #3 VFD RUNNING
			DI	I:110/2					WASTE PUMP #3 VFD COMMAND DIRECTION
			DI	I:110/3					WASTE PUMP #3 VFD ACTUAL DIRECTION
			DI	I:110/4					WASTE PUMP #3 VFD ACCELERATING
			DI	I:110/5					WASTE PUMP #3 VFD DECELERATING
			DI	I:110/6					WASTE PUMP #3 VFD ALARM
			DI	I:110/7					WASTE PUMP #3 VFD FAULTED
			DI	I:110/10					WASTE PUMP #3 VFD AT SPEED
					VFD Communications	DI		16	I:120/0
DI	I:120/1								WASTE PUMP #4 VFD RUNNING
DI	I:120/2								WASTE PUMP #4 VFD COMMAND DIRECTION
DI	I:120/3								WASTE PUMP #4 VFD ACTUAL DIRECTION
DI	I:120/4								WASTE PUMP #4 VFD ACCELERATING
DI	I:120/5								WASTE PUMP #4 VFD DECELERATING
DI	I:120/6								WASTE PUMP #4 VFD ALARM
DI	I:120/7								WASTE PUMP #4 VFD FAULTED
DI	I:120/10								WASTE PUMP #4 VFD AT SPEED

SECTION 13302
TESTING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to complete the testing of all devices and systems furnished and installed as detailed on Drawings, and as specified herein.
- B. Refer to Section 13300 for other general requirements.

1.02 RELATED WORK

- A. Refer to Section 13300.
- B. Division 1 "Equipment Testing and Start-up" Section.

1.03 SUBMITTALS

- A. Refer to Section 13300.
- B. Testing Submittals - Submit, in one submittal, the following testing related documents:
 - 1. Status signoff forms:
 - a. Develop and submit project specific I/O Status and Automatic Control Strategy signoff forms to be used during factory and field testing to organize and track each loop's inspection, adjustment, calibration, configuration, and testing status and sign off. Include sign-off forms for each testing phase showing all loops.
 - 1) Example forms are shown in the Appendices.
 - 2) Separate forms for factory and field testing can be used, or they can be combined, at the discretion of the PCSS.
 - 3) Submit testing forms prior to start of testing.
 - 2. Testing Procedures:
 - a. Submit procedures proposed to be followed for each of the tests specified herein. The test procedures shall serve as the basis for the execution of the required tests to demonstrate that the system meets and functions as specified.
 - b. Documents shall be structured in an orderly and easy to follow manner to facilitate an efficient and comprehensive test.
 - c. Test procedures shall indicate all pre-testing setup requirements, all required test equipment, and simulation techniques to be used.
 - d. Test procedures shall include the demonstration and validation under normal operating conditions and under various failure scenarios as specified in Contract Documents.
 - e. Testing may not start until all Testing Submittals have been approved.

C. Test Documentation:

1. Upon completion of each required test, document the test by submitting a copy of the signed off Testing Status forms. Testing shall not be considered complete until the signed-off forms have been submitted and approved. Submittal of other test documentation, including "highlighted" wiring diagrams with field technician notes, are not acceptable substitutes for the formal test documentation.

1.04 MAINTENANCE

- A. Refer to Section 13300.

1.05 COST OF TRAVEL

- A. Scheduled tests will only be attended once by Engineer /Owner. If test is not successful, all subsequent tests will be performed at Contractor's expense. Reimburse Owner for all costs, including labor and expenses, invoiced by Engineer and incurred by Owner for subsequent retests.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 TESTING - GENERAL

- A. Refer to Section 13300.
- B. Results of all testing shall be tracked on a project specific status sign off form or similar document. PCSS shall be responsible for maintaining the sheet. Appendix of this Section has an example template for this sheet.
- C. Tests the PCSS is required to perform are as follows:
 1. Factory Testing:
 - a. Unwitnessed Factory Test (UFT).
 - b. Witnessed Factory Test (WFT).
 2. Field Testing:
 - a. Operational Readiness Test (ORT).
 - b. Functional Demonstration Test (FDT).
 - c. Startup Acceptance Test (SAT).
- D. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment, and data, provide all special testing materials and equipment required for a suitable means of simulation.
- E. PCSS shall coordinate all required testing with Contractor, affected Subcontractors, Engineer, and Owner.

- F. No equipment shall be shipped to jobsite until Engineer or Owner has received all Factory Testing results and approved the system as ready for shipment.
- G. Engineer reserves the right to test or re-test any functions.
- H. Correction of Deficiencies:
 - 1. Deficiencies in workmanship and/or items not meeting specified testing requirements shall be corrected to meet specification requirements at no additional cost to Owner.
 - 2. Testing, as specified herein, shall be repeated after correction of deficiencies is made until specified requirements are met. This work shall be performed at no additional cost to Owner.

3.02 FACTORY TESTING - UNWITNESSED FACTORY TEST (UFT)

- A. Purpose of UFT is for PCSS to check system prior to Engineer and/or Owner attending factory testing. This type of testing should be part of any quality firm's internal QA/QC procedures.
- B. Temporary network connections will be required to confirm the network configuration. Temporary wiring of primary elements, final control elements, and field-mounted transmitters is not required.
- C. Hardware to be tested shall include all control system devices shown on System Architecture drawings and provided by PCSS.
- D. Tests to be performed shall include, but not be limited to, the following. Each of these tests shall be specifically addressed in Test Procedure submittal.
 - 1. All panels and enclosures being provided shall undergo a thorough inspection to verify integrity of cabinet enclosures, frame structures, paint work and finish, etc. Review panel drawings to ensure they accurately reflect panel layout and wiring.
 - 2. Perform a system audit to verify all components have been staged for test and have been documented properly with correct model numbers, serial numbers, etc. Following documentation of audit shall be provided at factory test and submitted as part of O&M Manual Documentation:
 - a. For each workstation and server, list of all software installed (including the operating system), with software revision number, software improvement modules or patches installed, license number and owner registration information, warranty period, vendor and local distributor names and contacts.
 - b. For each microprocessor-based component connected to control communication backbone in system (PLCs, managed switches, protocol converters, communication cards on final field devices, radios, etc.), list firmware revision, vendor and local distributor information, and system, warranty information, configuration parameters (e.g., communication settings, fail position settings, etc.)
 - 3. Panel wire pull tests shall be performed to ensure all wiring has been connected with appropriate torque to prevent wires from coming loose.

4. UPS shall be tested to verify UPS switch power correctly while keeping all UPS powered loads online. Testing of UPS to determine if they have been sized correctly to maintain specified run time shall be performed during field testing.
5. A 100 percent I/O point checkout shall be performed to verify proper operation of input/output points from panel terminations to HMI and OIT nodes. At a minimum, I/O checkout shall consist of four steps.
 - a. Discrete input signals shall be jumpered at field terminal blocks in control panels to verify proper status in HMI and OIT nodes.
 - b. Analog input signals shall be connected to a signal generator at field terminal blocks in control panels to verify proper status in HMI and OIT nodes and signals shall be verified at zero percent, 50 percent, and 100 percent of full scale.
 - c. Discrete output signals shall be tested by switching equipment to manual control at HMI and OIT nodes and turning the output on or other means to turn the output on. Then verify the output is on by connecting a digital multimeter to measure continuity at terminations, thus verifying command from PLC has properly executed contact closure.
 - d. Analog output signals shall be tested by switching the equipment to manual control at HMI and OIT nodes and turning output on or other means to turn the output on. Then verify output by utilizing a digital multimeter to measure current or voltage generated at termination points.
6. All control strategies shall be verified using simulation or other means to verify logic performs as expected. Verify faults and logical failure conditions for control strategies such as instrument failures, equipment failures, loss of communication between HMI Server and PLC, loss of peer-to-peer communication, out of range testing (over and under scale) for analog inputs, and all other strategies specified in control strategy document.
7. For each hardware enclosure, inspection shall include, but not be limited to, cabinet enclosures, frame structure, paint work and finish, dimensions, and hardware operability (i.e., fans, door hinges, keylocks, etc.).
8. For each subpanel, inspection shall include, but not be limited to, I/O subsystem physical layout, power supply sizing and mounting, cable routing, wire runs across hinges properly installed, fans and blowers unobstructed and mounted to maximize air flow, power conditioning correctly installed, and overall layout and installation of components meets manufacturer's recommendations and standard industry accepted practices.
9. All other control panel circuitry.
10. Following systems tests shall be performed:
 - a. Demonstrate ability to share data between operator workstations and servers.
 - b. Demonstrate ability of each workstation to print reports on all designated report printers.
 - c. Demonstrate ability for each workstation to read and write designated files from servers and other workstations on the network.
 - d. Demonstrate operability of all back-up and mass storage equipment.
 - e. Demonstrate communication failure and recovering self-healing ring testing.

- E. Upon successful completion of UFT, PCSS shall submit a record copy of test results as specified in PART 1. As part of this test results submittal, notify Engineer and Owner in writing that system is ready for WFT.

3.03 FACTORY TESTING - WITNESSED FACTORY TEST (WFT)

- A. Purpose of WFT is to allow Engineer or Owner representatives to witness functionality, performance, and stability of entire hardware and software system as a complete integrated system. WFT shall be run by PCSS and conducted at PCSS's facility.
- B. Required Documents for Test:
 - 1. Clean set of approved panel drawings and wiring diagrams.
 - 2. Set of Contract Documents - all drawings and specifications.
 - 3. All design change related documentation.
 - 4. Master copy of the PCSS developed factory testing signoff forms.
 - 5. Testing procedures.
- C. System shall operate continuously throughout WFT without failure, except where initiated per established test procedures. Any unanticipated failures may, at Owner or Engineer's option, result in overall WFT being deemed unsuccessful. All deficiencies identified during these tests shall be corrected and re-tested prior to completing WFT or shipment of panels to jobsite as determined by Owner/Engineer.
- D. Tests to be performed during the WFT shall include, but not be limited to, the following:
 - 1. A repeat of all tests specified in the UFT.
- E. Daily schedule during these tests shall be as follows:
 - 1. Morning meeting to review the day's test schedule.
 - 2. Scheduled tests and sign-offs.
 - 3. End of day meeting to review day's test results and to review or revise next day's test schedule.
 - 4. Unstructured testing period by witnesses.
- F. Upon successful completion of WFT, PCSS shall submit a record copy of test results as specified in PART 1.

3.04 FIELD TESTING - OPERATIONAL READINESS TEST (ORT)

- A. Purpose of ORT is to check that process equipment, instrument installation, instrument calibration, instrument configuration, field wiring, control panels, and all other related system

components are ready to monitor and control the processes. This test will determine if equipment is ready for operation.

- B. This test shall take place prior to FDT and startup. Prior to starting this test, relevant process equipment shall be installed and mechanically tested, instruments installed, control panels installed, and field wiring complete.
- C. Required Documents for Test:
 - 1. Master copy of the PCSS developed field testing signoff forms.
 - 2. Testing procedures.
 - 3. Calibration forms.
- D. These inspections, calibrations, and tests do not require witnessing. However, Engineer may review and spot-check testing process periodically. Any deficiencies found shall be corrected by PCSS prior to commencement of Functional Demonstration Test.
- E. PCSS shall maintain Sign-off forms and Calibration forms at job site and make them available to Engineer/Owner at any time.
- F. Following tests shall be performed as part of ORT:
 - 1. Instrument calibration, configuration, and set-up.
 - 2. Input/Output (I/O) Testing to HMI and OITs.
 - 3. Testing of control strategies.
- G. Instrument calibration, configuration, and set-up:
 - 1. Calibrate, configure, and set-up all components and instruments to perform specified functions.
 - 2. Calibration form:
 - a. For any component or instrument requiring dip switch settings, calibration, or custom configuration, maintain a calibration form in field documenting this information. These forms shall provide a summary of the actual settings used in the field to allow an Instrument technician to replace the device entirely and configure it to function as it did before.
 - b. This information shall be added to Instrument data sheet, shall be added to a copy of manufacturer's standard "Configuration Sheet", or a separate form shall be created.
 - 1) If a separate form, the form shall list Project Name, Loop Number, ISA Tag Number, I/O Module Address, Manufacturer, Model Number/Serial Number, Output Range and Calibrated Value.
 - c. Some examples of required information are:
 - 1) For Discrete Devices: Actual trip points and reset points.
 - 2) For Instruments: Any configuration or calibration settings entered into instrument
 - 3) For Controllers: Mode settings (PID).

- 4) For I/O Modules: Dip switch settings, module configuration (if not documented in native programming documentation).
- d. Maintain a copy of these forms in field during testing, and make them available for inspection at any time.
- e. For any device that allows a software back-up of configuration files to a laptop, make configuration files available to Engineer/Owner for inspection. Submit as part of Final System Documentation as specified in Section 13300.

H. I/O Testing:

1. Purpose of I/O testing is to check that process equipment, instrument installation, calibration, configuration, field wiring, and control panels are set-up correctly to monitor and control the processes. This test is commonly referred to as a "loop test" or an I/O checkout.
2. PCSS in conjunction with Contractor shall test signals under process conditions. Preferred test method will always be to execute test wherever possible to end elements. For example, preferred test will prove valve open/close limit switches by operating valve, not by installing a jumper on limit switch contacts. However if equipment or process is not available to test a signal over its entire calibrated range, PCSS may test using a simulation methods and make a note on sign-off form.
3. The following I/O tests shall be performed:
 - a. Discrete Input: At device or instrument, change signal condition from inactive to active state. Observe results on all indicators within loop such as HMI screens, OIT screens, pilot lights, horns, beacons, etc.
 - b. Analog Input: Test analog signal over entire engineering range at various intervals including 0, 50%, and 100% as well as on increasing and decreasing range. Observe results on all indicators within loop such as HMI screens, OIT screens, recorders, digital indicators, etc.
 - c. Discrete output signals shall be tested by switching equipment to manual control at the HMI and OIT nodes and turning output on or using other means to turn output on. Then verify equipment responds accordingly.
 - d. Analog output signals shall be tested by switching equipment to manual control at HMI and OIT nodes and turning output on or other means to turn output on. Then verify equipment responds accordingly.

I. Testing of Automatic Control Strategies:

1. All automatic control strategies shall be verified using actual process equipment and instruments, or other means, to verify logic performs as expected. Verify faults and logical failure scenarios for control strategies such as instrument failures, equipment failures, loss of communication between HMI Server and PLC, loss of peer-to-peer communication, out of range testing for analog inputs, loss of power, and all other strategies specified in control strategy document.
2. Loop Tuning - All PID control loops (single or cascade) shall be tuned following device installation but prior to commencement of the Functional Demonstration Test.

- a. Optimal loop tuning shall be achieved either by auto-tuning software or manually by trial and error, Ziegler-Nichols step-response method, or other documented process tuning method.
 - b. Determine and configure optimal tuning parameters to assure stable, steady state operation of final control elements running under the control PID. Each control loop that includes anti-reset windup features shall be adjusted to provide optimum response following startup from an integral action saturation condition.
 - c. Tune all PID control loops to eliminate excessive oscillating final control elements. Loop parameters shall be adjusted to achieve a decay ratio of 1/4 or better. In addition, loop steady state shall be achieved at least as fast as the loop response time associated with critical damping.
 - d. Loop performance and stability shall be verified by step changes to setpoint in the field.
 - e. Submit loop tuning documentation as required by Section 13300.
- J. Repeat all systems tests specified under factory testing.
- K. UPS shall be tested to verify UPS switch power correctly while keeping all UPS powered loads online. Also, test sizing of UPS by switching off line power to UPS and verify if they maintain specified run time.
- L. For all panels with enclosures modified by this Contract, internal control panel temperature shall be tested under full running conditions to ensure proper cooling/ventilation is being provided.
- M. Upon successful completion of ORT, PCSS shall submit a record copy of test results as specified in PART 1 and request scheduling of FDT.

3.05 FIELD TESTING - FUNCTIONAL DEMONSTRATION TEST (FDT)

- A. After facility is started-up and running treatment process in automatic control to extent possible, a Functional Demonstration Test shall be performed. Purpose of FDT is to allow Engineer or Owner representatives to witness actual functionality, performance, and stability of system while connected to process equipment.
- B. Required Documents for Test:
1. Set of panel drawings and wiring diagrams from ORT with corrections noted
 2. Set of Contract Documents - all drawings and specifications.
 3. All design change related documentation.
 4. Signed-off master copy of the PCSS developed field testing signoff forms.
 5. Testing procedures.
 6. Copy of completed calibration forms.
 7. One copy of all O & M Manuals for PCSS supplied equipment.

- C. A witnessed FDT shall be performed on each process area. To extent possible, repeat testing performed during ORT.
- D. Daily schedule specified to be followed during factory tests shall also be followed during FDT.
- E. After coordinating with Operations, a "Black Start" of the plant shall be performed to confirm plant operation recovers as specified in Contract Documents. Black start means shutting off power to the plant and turning it back on. Separate tests shall be performed by recovering the plant while on generator (if a generator is specified) and while on utility power.
- F. Punch list items and resolutions noted during test shall be documented on Punch list/Resolution form. In event of rejection of any part or function test procedure, PCSS shall perform repairs, replacement, and/or retest within 10 days.
- G. Upon successful completion of the FDT, PCSS shall submit a record copy of test results as specified in "Part 1 - General".

3.06 FIELD TESTING - 30-Day SITE ACCEPTANCE TEST (SAT)

- A. After completion of FDT, and the system is started-up and running in automatic mode, the system shall undergo a 30-day site acceptance test.
- B. While this test is proceeding, the Owner shall have full use of system. Only plant operating personnel shall be allowed to operate equipment associated with live plant processes. Plant operations shall remain responsibility of Owner and decision of plant operators regarding plant operations shall be final.
- C. During this test, PCSS personnel shall be available to address any potential issues that would impact system operation. PCSS is expected to provide personnel for this test who have an intimate knowledge of hardware and software of system. When PCSS personnel are not on-site, PCSS shall provide cell phone/pager numbers that Owner personnel can use to ensure that support staff is available by phone and/or on-site within four hours of a request by operations staff.
- D. Any malfunction during test shall be analyzed and corrections made by PCSS. In event of rejection of any part or function, PCSS shall perform repairs or replacement within 48 hours.
- E. For the test to be certified as successful, no major malfunctions can take place over the 30-day period. A major malfunction is one that cannot be repaired within 48 hours. If a major malfunction occurs, the test shall be re-started when the major malfunction is corrected.
- F. Throughout duration of SAT, no software or hardware modifications shall be made to system without prior approval from Owner or Engineer.

3.07 CERTIFICATE OF INSTALLATION

- A. Following successful completion of SAT test, PCSS shall submit a Certification of Installation for approval.

END OF SECTION

APPENDIX 13302-A: EXAMPLE INPUT/OUTPUT (I/O) STATUS SIGN OFF FORM

An example template for I/O Status signoff form to be used for documenting testing results to Owner is attached. PCSS is required, prior to testing, to create a project specific I/O Status signoff form based on attached template or approved equal. PCSS may obtain an electronic copy of template from Engineer or develop it on their own.

APPENDIX 13302-B: EXAMPLE AUTOMATIC CONTROL STRATEGIES SIGN OFF FORM

An example template for Automatic Control Strategies signoff form to be used for documenting testing results to Owner is attached. PCSS is required, prior to testing, to create a project specific Automatic Control Strategies signoff form based on attached template or approved equal. PCSS may obtain an electronic copy of template from Engineer or develop it on their own.

4-Jun-14

[Project Name] Appendix A - Input/Output (I/O) Status Sign-Off Form

All Sections below are required to be filled out by PCSS as part of Field Testing.

Instrument Alarm Setpoint - Setpoint for any alarms set by PCSS

Wiring Complete - Signal wired from field device to PLC

I/O Tested - Signal tested from field device to SCADA HMI

PLC	Signal Tag	Description	Range or Active State when closed	P&ID	Signal	Rack	Slot	Channel	Instrument Alarm Setpoint	Calibrate, config., and Wiring complete	Date	PCSS I/O Testing	Date	I/O Testing to the HMI	Date	Notes
PLC-SC	LIT-4000-1	Secondary Clarifier No. 1 Sludge Level	0-10 ft	8	AI	2	1	0								
PLC-SC	LIT-4010-3	Secondary Clarifier No. 3 Sludge Level	0-10 ft	8	AI	2	1	1								
PLC-SC	SI-4100-1	RAS Pump No. 1 Speed Feedback	0-100%	14	AI	2	1	2								
PLC-SC	SI-4100-4	RAS Pump No. 4 Speed Feedback	0-100%	15	AI	2	1	3								
PLC-SC	FTI-4102-1	RAS Flow Pumps 1-3	0-1900 GPM	14	AI	2	1	4								
PLC-SC	SI-4110-1	WAS Pump No. 1 Speed Feedback	0-100%	14	AI	2	1	5								
PLC-SC	N/A	Spare Slot	N/A	N/A	Spare	2	6	N/A								
PLC-SC	SC-4100-1	RAS Pump No. 1 Speed Setpoint	0-100%	14	AO	2	7	0								
PLC-SC	SC-4100-2	RAS Pump No. 2 Speed Setpoint	0-100%	14	AO	2	7	1								
PLC-SC	SC-4100-3	RAS Pump No. 3 Speed Setpoint	0-100%	14	AO	2	7	2								
PLC-SC	SC-4110-1	WAS Pump No. 1 Speed Setpoint	0-100%	14	AO	2	7	3								
PLC-SC	Spare	Spare	N/A	N/A	AO	2	7	4								
PLC-SC	Spare	Spare	N/A	N/A	AO	2	7	5								
PLC-SC	TSH-4000-1	Secondary Clarifier No. 1 High Temp	Normal	8	DI	3	1	0								
PLC-SC	XA-4000-1	Secondary Clarifier No. 1 Motor Overload	Normal	8	DI	3	1	1								
PLC-SC	WAH-4000-1	Secondary Clarifier No. 1 High Torque	Normal	8	DI	3	1	2								
PLC-SC	WAH-4000-1	Secondary Clarifier No. 1 High High Torque	Normal	8	DI	3	1	3								
PLC-SC	YRI-4000-1	Secondary Clarifier No. 1 On/Off	On	8	DI	3	1	4								
PLC-SC	YCI-4000-1	Secondary Clarifier No. 1 In Remote	In Remote	8	DI	3	1	5								
PLC-SC	YFI-4100-1	RAS Pump No. 1 VFD Fault	Normal	14	DI	3	1	6								
PLC-SC	FAL-4100-1	RAS Pump No. 1 Low Flow	Normal	14	DI	3	1	7	50 GPM	RJM	12/18/2011	JAS	12/22/2011	MIC	12/29/2011	Example completed line
PLC-SC	Spare	Spare	Normal	14	DI	3	1	8								
PLC-SC	YRI-4100-1	RAS Pump No. 1 Running	Running	14	DI	3	1	9								
PLC-SC	YCI-4100-1	RAS Pump No. 1 In Remote	In Remote	14	DI	3	1	10								
PLC-SC	YFI-4110-1	WAS Pump No. 1 VFD Fault	Normal	14	DI	3	1	11								
PLC-SC	FAL-4110-1	WAS Pump No. 1 Low Flow	Normal	14	DI	3	1	12								
PLC-SC	Spare	Spare	Normal	14	DI	3	1	13								
PLC-SC	YRI-4110-1	WAS Pump No. 1 Running	Running	14	DI	3	1	14								
PLC-SC	YCI-4110-1	WAS Pump No. 1 In Remote	In Remote	14	DI	3	1	15								
PLC-SC	HSS-4000-2	Secondary Clarifier No. 2 Start Command	Start	8	DO	4	6	0								
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	1								
PLC-SC	HSS-4100-2	RAS Pump No. 2 Start Command	Start	14	DO	4	6	2								
PLC-SC	HSS-7000-2	Sludge Holding Tank/Blower No. 2 Start Command	Start	17	DO	4	6	3								
PLC-SC	HSS-4100-5	RAS Pump No. 5 Start Command	Start	15	DO	4	6	4								
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	5								
PLC-SC	HSS-4105-1	Secondary Scraper Pump No. 2 Start/Stop	Start	15	DO	4	6	6								
PLC-SC	HSS-4110-2	WAS Pump No. 2 Start/Stop Command	Start	15	DO	4	6	7								
PLC-SC	7160-FQI-1	Sludge Loadout LCP Pumping Indicator	Pumping	17	DO	4	6	8								
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	9								
PLC-SC	HSS-7115-2	Sludge Holding Tank Mixer No. 2 Start	Start	17	DO	4	6	10								
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	11								
PLC-SC	HSS-7117-2	Sludge Holding Tank Discharge Valve No. 2 Open CMD	Open	17	DO	4	6	12								
PLC-SC	HSS-7117-2	Sludge Holding Tank Discharge Valve No. 2 Close CMD	Close	17	DO	4	6	13								
PLC-SC	HSS-7120-2	TS Transfer Pump No. 2 Start Command	Start	17	DO	4	6	14								
PLC-SC	Spare	Spare	N/A	N/A	DO	4	6	15								

4-Jun-14

[Project Name] Appendix B - Automatic Control Strategies Sign-Off Form

All Sections below are required to be filled out by PCSS as part of Testing Auto. Control Strategies. - Loop operational in Automatic as defined in Control Strategies

Control Strategies Loop #	Control Strategy Description	P&ID	Auto. Control Strategy	Date	Notes
LOOP 281 - 284	LOW FLOW PUMPS	8			
LOOP 290	LOW EQ CHANNEL FLOW NO.4	8			
LOOP 300	MICROFILTRATION AIR SUPPLY LOW PRESSURE	10			
LOOP 351, 352	SITE LIFT STATION PUMP NO.1 AND NO. 2	12			
LOOP 355	SITE LIFT STATION HIGH AND LOW LEVEL CONTROL	12			
LOOP 371, 372	SLUDGE HOLDING TANK NO.1 AND NO. 2 LEVEL	14			
LOOP 381, 382	SLUDGE TRANSFER PUMPS	14			
LOOP 385	SLUDGE TRANSFER PUMPS REMOTE START/STOP COMMAND	14			
LOOP 700	EFFLUENT PUMPING STATION LEVEL	14			
LOOP 701, 702, 703	EFFLUENT PUMP NO.1	14			
LOOP 840	POST AERATION CHANNEL AIR FLOW CONTROL	15			
LOOP 900	SLUDGE TRANSFER PUMPS DISCHARGE FLOW	8			
LOOP 971	CENTRIFUGE SLUDGE FEED PUMP NO.1	8			
LOOP 1001	CENTRIFUGE NO.1 SLUDGE FEED FLOW CONTROL	8			
LOOP 1411, 1412	SODIUM HYPOCHLORITE STORAGE TANKS LEVEL	8			
LOOP 1421, 1422	SODIUM HYPOCHLORITE PUMPS	8			
LOOP 1430	SODIUM HYPOCHLORITE STORAGE TANKS CONTAINMENT AREA HIGH LEVEL DETECTION	14			
LOOP 2051, 2052, 2053	DIESEL ENGINE GENERATOR STATUS	14			
LOOP 2055	TRANSFER SWITCH STATUS	14			
LOOP 2060	GENERATOR KILOWATTS MONITORING	14			
APPENDIX ONE	EQUIPMENT RESTART DURING A POWER LOSS WITH THE GENERATOR RUNNING	14			
APPENDIX TWO	EQUIPMENT RESTART WITH POWER RESTORED AFTER A POWER LOSS	14			
N/A	SELF-HEALING CAPABILITIES OF NETWORK	N/A			
N/A	REDUNDANT SCADA SERVER FAILOVER AND RECOVERY	N/A			

SECTION 13303
TRAINING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish training as specified herein.
- B. This Section covers the training requirements for all devices and systems furnished and installed as detailed on the Drawings.
- C. Refer to Section 13300.

1.02 RELATED WORK

- A. Refer to Section 13300.

1.03 SUBMITTALS

- A. Refer to Section 13300 for general submittal requirements.
- B. Preliminary Training Plan Submittal
 - 1. Prior to the preparation of the Final Training Plans, submit outlines of each training course including course objectives and target audience, resumes of instructors, prerequisite requirements for each class, and samples of handouts for review.
- C. Final Training Plan Submittal
 - 1. Upon receipt of the Engineer's comments on the preliminary training plan, submit the specific proposed training plan. The training plan shall include:
 - a. Definitions, objectives, and target audience of each course.
 - b. Schedule of training courses including proposed dates, duration and locations of each class.
 - c. Complete copy of all proposed handouts and training materials. Training information shall be bound and logically arranged with all materials reduced to a maximum size of 11 inch by 17 inch, then folded to 8.5 inch by 11 inch for inclusion into the binder.

PART 2 PRODUCTS

2.01 N/A

PART 3 EXECUTION

3.01 GENERAL

- A. The cost of the training programs shall be included in the Contract price. The training and instruction shall be directly related to the system being supplied. The training program shall represent a comprehensive program covering all aspects of the operation and maintenance of the system.

- B. All training schedules shall be coordinated with and at the convenience of the Owner. Shift training may be required to correspond to the Owner's working schedule.
- C. All onsite instructors must be intimately familiar with the operation and control of the Owner's facilities.
- D. Provide detailed training manuals to supplement the training courses. The manuals shall include specific details of equipment supplied and operations specific to the project. The manuals shall be provided in hardcopy for each student. Provide electronic copy of each training manual in PDF format for Owner's future use.
- E. The trainer shall make use of teaching aids, manuals, slide/video presentations, etc. After the training services, all training materials shall be delivered to Owner.
- F. The Owner reserves the right to videotape all custom training sessions. All training tapes shall become the sole property of the Owner.

3.02 TRAINING SUMMARY

- A. The following training courses listed in the summary table shall, as a minimum, be provided:

Description	Minimum Course Duration (hours)	Maximum Number of Trainees per Course	Number of Times Course to be Given	Intended Audience
Control System Overview Seminar	4	8	1	Administrator, Maintenance
PLC Hardware/Software	2	8	1	Administrator, Maintenance
Instruments	2	8	1	Maintenance
Instruments - Operator familiarity	2	8	1	Operations, Management
Operator Training (Pre start-up)	4	12	2	Operations
Operator Training (Post start-up)	4	12	2	Operations

- B. Definitions of audience roles
 1. Administrator - personnel responsible for maintaining the HMI / SCADA system.
 2. Maintenance - personnel responsible for maintaining the field controller hardware and instrumentation system.
 3. Operations - personnel responsible for daily plant operations.
 4. Management - non-daily operations personnel

3.03 ONSITE TRAINING

- A. Training personnel shall be intimately familiar with the control system equipment, its manipulation, and configuration. Training personnel shall command knowledge of system debugging, program modification, troubleshooting, maintenance procedure, system operation,

and programming, and shall be capable of transferring this knowledge in an orderly fashion to technically oriented personnel.

B. Control System Overview Seminar

1. Provide training for the Owner's personnel in the functionality, maintenance, and troubleshooting, of the installed Control System. The training shall be held before the Functional Demonstrator Test (FDT), but not more than two months before.
2. Training and instruction shall be specific to the system that is being supplied.
3. Training shall consist of classroom instructions and hands-on instruction utilizing the Owner's system.
4. Detailed training shall be provided on the actual configuration and implementation for this Contract. Training shall cover all aspects of the system that will allow the Owner's personnel to maintain, modify, troubleshoot, and develop future additions/deletions to the system. The training shall cover the following subjects, as a minimum:
 - a. An overview of the Control system explaining how the hardware and software supplied under this Contract is used for the operation and control of the facilities.
 - b. A block diagram presentation of the Control system showing how and what information flow within the system and what each functional unit does.
 - c. A walkthrough of the installed system explaining each of the items covered in the functional units' discussion. The features and functions of operator controls and interfaces shall be discussed.
 - d. An explanation of the operator interfaces including a demonstration of how to use an operator's workstation to monitor, control, navigate, display trends, and all other operational features of the system. Discussion of process control of individual processes shall be addressed outside of this course.
 - e. Periodic maintenance.
 - f. Troubleshooting and diagnosis.
 - g. Network configuration, communications, and operation.

C. Programmable Logic Controller (PLC) Hardware and Software

1. Provide training for the Owner's personnel in the operation, maintenance, troubleshooting, etc. with the PLC hardware and software system. The training shall be held before the FDT, but not more than two months before.
2. Training and instruction shall be specific to the system that is being supplied.
3. Training shall consist of classroom instructions and hands-on instruction utilizing the Owner's system.
4. Detailed training shall be provided on the actual configuration and implementation for this Contract. Training shall cover all aspects of the PLC system that will allow the Owner's personnel to maintain, modify, troubleshoot, and develop future additions/deletions to the PLC system. The training shall cover the following subjects, as a minimum:
 - a. PLC system overview.
 - b. PLC system architecture.

- c. PLC system hardware components and specific equipment arrangements.
- d. PLC system startup, shut down, load, backup, and PLC failure recovery.
- e. Periodic maintenance.
- f. Troubleshooting and diagnosis down to the I/O card level.
- g. PLC configuration, communications, and operation.

D. Instrument Training

1. Provide instruction on the maintenance of the field and panel instrumentation for the Owner's instrumentation technicians. This training shall be conducted before the FDT, but no more than 1 month before and at a time suitable to the Owner. This training shall take place at the Owner's facility. As a minimum the following shall be included:
 - a. Training in standard hardware maintenance for the instruments provided.
 - b. Specific training for the actual instrumentation configuration to provide a detailed understanding of how the equipment and components are arranged, connected, and set up for this Contract.
 - c. Test, adjustment, and calibration procedures.
 - d. Troubleshooting and diagnosis.
 - e. Periodic maintenance.

E. Instruments - Operator familiarity

1. Provide operator level instruction on the use of the field and panel instrumentation for the Owner's operations staff. This training shall be conducted before the 30 day site acceptance test, but no more than 1 month before and at a time suitable to the Owner. This training shall take place at the Owner's facility. Include hands on demonstration of the information each transmitter indicates and the method used to retrieve any operator information from the transmitter, including use of pushbuttons and interpretation of international graphic symbols used on the instruments.

F. Operator Control System Training (pre or post start-up)

1. Operator training shall cover plant operation with the control system and use of the HMI display screens, including at a minimum all the following items:
 - a. Basics of HMI control and navigation
 - b. Alarming and Interlocks
 - c. Auto functionality of automated processes and HMI control.
 - d. Failure modes of equipment and operator responses.
2. Minimum of two operator training sessions (Pre-Startup) for operators shall be held 1 week before system startup. The pre-startup training shall make use of the Simulator specified in this project. Additional one or two operator training sessions (Post-Startup) for operators shall be held one week after system startup.
3. Operator training shall be held at the convenience of the OWNER. This training may be held during the day, late at night, or very early in the morning to accommodate the OWNER'S shift schedule.
4. Operator training shall be introductory in nature during pre-startup training and more in-depth and detailed during post-startup training.

5. At a minimum, the following teaching aids shall be available for distribution during Operator training sessions:
 - a. Preliminary O&M Manuals (pre-startup); Final O&M Manuals (post-startup).
 - b. P&IDs.
 - c. Daily syllabus.

6. Fifty percent of all Operator training shall be "hands on" utilizing the installed Control System to the fullest extent possible. Confirm the operability of the Control System before commencing training. Training performed using a non-functioning Control System shall be rejected and repeated.

END OF SECTION

SECTION 13305
I&C - CONTROL DESCRIPTIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This section is provided to clarify the control strategies to be used to program the system.
- B. All SCADA PLC controller programming and SCADA Operator Interface Terminal (OIT) or Operator Workstation Station (OWS) graphics and programming shall be performed as defined in Section 13300.

1.02 RELATED WORK

- A. Refer to Section 13300.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 GENERAL

- A. The control descriptions are sorted by loop number for each area. The loop index has three columns associated with it; Loop Number, Loop Description, and Page. Each loop is associated with a specific SCADA I/O cabinet location to which it shall communicate.
- B. The control descriptions are broken into a hierarchical layer concept. The lowest layer of control is from the piece of equipment or from the piece of equipment's panel or drive. The highest layer of control is by the PLC System with its associated HMI system located in the main control room and operator interface terminals (OITs) throughout the plant. The SCADA PLC/HMI/OIT refers to the SCADA PLC, which does the actual monitoring and control logic for the process equipment, the SCADA HMI (Wonderware System) which is located on operator workstations (OWS), and the OIT (PanelView Plus) located on the front of the PLC-RAS/WAS enclosure. Where indicated as "SCADA PLC/HMI/OIT" all functionality available at the OWS shall also be available on the OIT.

3.02 CONTROL FUNCTION DEFINITIONS AND GENERAL CRITERIA

- A. The hardware and/or software functions noted by this paragraph reference are to be implemented by the SCADA PLC/HMI/OIT control system specified herein. These general criteria only apply to the WAS Pump system. The other systems being imported from the old PLC-5 (such as the RAS pump system) are to function per their existing control strategies and do not need to be modified to comply with this paragraph 3.02.
- B. Any interlocks that are represented, before the local operational descriptions, or are stated as hardwired interlocks, shall interlock all the controls locally and at the SCADA PLC/HMI/OIT.

The SCADA PLC shall be programmed to shutdown that equipment if that hardwired interlock is also wired to the SCADA PLC.

- C. Any interlocks that are represented in a particular layer of the operational descriptions, shall interlock all the controls in that layer and the layer after it. However the interlock shall not interlock the commands in the layer before it.
- D. Motors with VFD controls shall be provided with HMI adjustable minimum and maximum speed setpoints. If the VFD is used in a PID control loop, the output of the controller shall not fall below or exceed the minimum and maximum speed setpoints, except where explicitly stated in the detailed control descriptions below.
- E. When an analog signal goes outside the 4-20 mA range due to a failure at the instrument or PLC card, the following SCADA programming shall take place:
 - 1. Alarm the signal at any local OITs and in the HMI system.
 - 2. If the analog signal is associated with a control loop or ratio control loop that loop shall go into manual.
 - 3. If the analog signal is used in a calculation, that calculation shall use the last good analog signal. The computer shall place the control loop in manual if using the calculation.
- F. All interlocks that shutdown (Stop a piece of equipment and prevent it from being restarted or moved) shall be shown on the faceplate pop-up graphic for that piece of equipment.
- G. The run confirms or on status of all motors shall be accumulated to calculate a run time status of the equipment on the HMI graphic. Each run time accumulation shall come with a reset button on the HMI screen.
 - 1. Current Day's Runtime in XX.XX Hrs
 - 2. Yesterday's Runtime in XX.XX Hrs
 - 3. Current Month's Runtime in XXX.X Hrs
 - 4. Last Month's Runtime in XXX.X Hrs
 - 5. Total Runtime in XXXXXX Hrs
- H. All flow indications shall be totalized. Do not totalize if the analog signal is outside the 4-20 mA range. Each flow totalization shall come with a reset button on the HMI screen. Do not totalize if the value of the flow input is less than 2% of the full range of the input. The flow totalizer units shall be appropriate for the total volume anticipated for the time period. Totalized flow in million gallons shall be rounded to two decimals (X.XX). Totalized flow shall be rounded to the nearest gallon.
 - 1. Current Day's Flow Totalization
 - 2. Yesterday's Flow Totalization

3. Current Month's Flow Totalization
4. Last Month's Flow Totalization
5. Total Flow Totalization

I. Motor Failures

1. Supervisor level users shall be able to set a common time setpoint that will be used to generate the following alarms.
2. All motors being remotely controlled will generate a fail-to-start when the PLC sends the "start" command to the motor and it does not start after a supervisor adjustable time setpoint. When a fail-to-start is generated, the start output command shall be de-energized and the motor shall be prevented from starting until reset is issued from the HMI.
3. All motors being remotely controlled will generate a fail to stop when the PLC sends the "stop" command to the motor and it continues to run after a supervisor adjustable time setpoint.
4. All motors with adjustable speed control will generate a "speed deviation" alarm when the motor is running and PLC sends a speed setpoint to the motor and it does not reach the correct speed (within a deadband initially set to 10%) within a supervisor adjustable timer setpoint. The motor shall remain running.

J. Valve Failures

1. Supervisor level users shall be able to set a common time setpoint that will be used to generate the following alarms.
2. All discrete valves (open-close) being remotely controlled will generate a fail to open alarm when the PLC sends the "open" command to the valve and it does not reach the "opened" limit within a supervisor adjustable time setpoint.
3. All discrete valves (open-close) being remotely controlled will generate a fail to close alarm when the PLC sends the "close" command to the valve and it does not reach the "closed" limit within a supervisor adjustable time setpoint.

K. Analog Alarms

1. Analog alarming capability shall be provided for all analog signals monitored by the PLC as follows.
2. Supervisor level users shall be able to set a common time setpoint that will be used to generate the following alarms after the timer expires. The following alarms (setpoints are supervisor adjustable) will be generated based on the analog feedback value. Each alarm shall include the ability for individual enabling and disabling. High and low analog alarms shall be initially enabled as indicated in the "Alarms/Monitoring" section of each loop.
 - a. High-High
 - b. High

- c. Low
- d. Low-Low
- e. Loss of Signal (Analog signal out of range)

3.03 INDIVIDUAL CONTROL DESCRIPTIONS AND CONTROL SEQUENCES

LOOP INDEX		
LOOP No.	LOOP DESCRIPTION	PAGE No.
LOOP 511 thru 514	WASTE ACTIVATED SLUDGE PUMPS.....	5
LOOP 511 thru 514	WASTE ACTIVATED SLUDGE PUMP DISCHARGE VALVES	9
LOOP 520	WASTE ACTIVATED SLUDGE FLOW	10
LOOP 520	WASTE ACTIVATED SLUDGE PRESSURE.....	11
LOOP 530	UPS-RASWAS MONITORING	11

LOOP 511 thru 514 WASTE ACTIVATED SLUDGE PUMPS

General: Waste activated sludge is pumped using 4 (four) variable speed pumps into a force main. When automatically controlled, the flow of wasted sludge is determined by an operator setpoint which is compared to the flow meter reading of the discharge header.

Regardless of whether the pump is started in manual or automatic mode, the pump will start against a closed valve. Upon shutdown, the valve will close before the pump motor is stopped. Refer to Loops 511 thru 514 for additional details.

Control:

Hardwired Interlocks:

If a pump E-Stop is detected the pump shall stop and not be allowed to start.

If a pump high temperature switch (TSH) is detected the pump shall stop and not be allowed to start.

Local (At VFD Panel):

Local: When the Local/Off/Remote selector switch is in the “Local” position, the pump can be started, stopped, and have its speed controlled from the controls at the VFD.

Off: When the Local/Off/Remote selector switch is in the “Off” position, the pump shall be stopped.

Remote: When the Local/Off/Remote selector switch is in the “Remote” position, the pump control is transferred to the SCADA system.

SCADA PLC/HMI/OIT:

Software Interlock:

If a high discharge pressure is detected on the common discharge header (HMI adjustable), all active pumps will be called to stop. They shall not be permitted to start until the pump reset is pressed at the HMI.

If the discharge valve remains closed while the pump is confirmed running for an operator adjustable amount of time, the pump shall be shut down. The pump shall be prevented from re-starting until the pump reset is pressed at the HMI.

On/Off and Speed Control:

Manual: The pump can be manually started or stopped by the operator at the HMI. The speed of the pump can also be controlled by the operator at the HMI.

Auto: The pumps shall operate in a Lead/Lag 1/Lag 2/Standby sequence. The lead/lag selection shall be in either Operator Mode or Alternation Mode as selected by the operator at the HMI. In operator mode, the operator shall select Lead, Lag 1, Lag 2, Standby or Offline for each pump from the HMI using radio buttons on the popup display. The order can be changed at any time, but no two pumps can be selected to have the same lead/lag position. For example, if Pump 1 is the lead pump, then it must be placed offline before Pump 2 can be selected as the lead pump. When placed offline, the pump shall not run in automatic mode. In alternation mode, the pumps shall alternate after the lead pump is automatically stopped by the control strategy. Alternation mode shall automatically sequence the lead/lag order once per week. For example, the Lead pump will become the Standby, Standby to Lag 2, Lag 2 to Lag 1, and Lag 1 to Lead.

The operator can manually enter a flow setpoint value for a PID flow controller which shall output a pump speed signal between 0-100%. When initially placed into automatic mode, the lead pump shall start. The speed of the lead pump shall be automatically controlled via the associated PID controller (FC-520), using FI-520 as the process variable.

Once the command signal for that pump reaches the adjustable "Start Lag 1" setpoint (initially set to 95%) and the flow setpoint is greater than the process variable by more than an adjustable deadband setpoint, the second VFD pump (Lag 1) shall start. With the two pumps running, the two VFD pumps shall vary their speed to meet the flow demand. Both pumps shall run at the same speed. An additional setpoint, "Start Lag 2" setpoint (initially set to 95%) shall control the third VFD pump (Lag 2) in a similar fashion.

When the controller output falls below the “Stop Lag 2” setpoint and the flow value is below the flow setpoint by more than the adjustable deadband, the Lag 2 pump shall stop. The remaining VFD pumps shall then vary speed to meet the flow demand.

When the controller output falls below the “Stop Lag 1” setpoint and the flow value is below the flow setpoint by more than the adjustable deadband, the Lag 1 pump shall stop. The Lead VFD pump shall then vary speed to meet the flow demand.

An adjustable timer shall be provided and shall time out before starting or stopping a lag pump, to avoid unnecessary starting and stopping.

The lead pump will always run unless the WAS flow setpoint is zero or an interlock causes the pump to shut down. No more than three (3) pumps shall run at one time. In the event that the next pump in a sequence fails to start, the next pump in the sequence shall start.

An adjustable maximum speed setpoint shall be provided for each WAS pump. All setpoints shall adhere to the minimum and maximum setpoint restricts. For example, if the maximum speed setpoint is set to 90% the PID controller shall not output a speed higher than 90%. Similarly, if the “Start Lag 1” setpoint is set to 95% and the maximum speed setpoint is changed to 90%, the “Start Lag 1” setpoint shall automatically change such that the controller will not be prevented from starting the next pump in the sequence.

All speed control, manual and automatic, shall prevent the pumps from running above and below the maximum and minimum speeds, respectively.

Alarms / Monitoring:

A common alarm shall be activated when any hardwired I/O or software interlock is activated that prevents the pump from running. This shall be sent to the VFD as a discrete output from the PLC to illuminate the alarm light on the panel.

Local (At VFD panel):

Pump Run
Common Alarm
Various information on VFD keypad

SCADA PLC/HMI/OIT (via Ethernet/IP):

VFD At Speed
Accelerating
Decelerating
Command Direction
Actual Direction
VFD Enabled
VFD Speed
Seal Water Alarm
High Motor Temperature
E-Stop
Remote Status
Run Status
VFD Alarm
VFD Fault
VFD Output Frequency
VFD Output Voltage
VFD Output Current
VFD Output Power
VFD Output Power Factor
VFD Elapsed MWH
VFD Elapsed Run Time
VFD DC Bus Volts
VFD Commanded Speed Reference
Ten (10) Additional Analog Inputs to be determined during startup
Ten (10) Additional Discrete Inputs to be determined during startup

LOOP 511 thru 514 WASTE ACTIVATED SLUDGE PUMP DISCHARGE VALVES

General: A motorized valve on the discharge of the pump shall be controlled automatically to open and close based on the associated WAS pump's run status. The valve's position feedback signal along with the open/stop/close outputs shall be used to position the valves to a specific open position as explained below.

Control:

Local (At Valve Actuator):

Local: When the Local/Remote selector switch is in the "Local" position, the valve can be opened or closed from the controls on the actuator.

Remote: When the Local/Remote selector switch is in the "Remote" position, the valve control is transferred to the SCADA system.

SCADA PLC/HMI/OIT:

Software Interlock:

If the pump is stopped and the discharge valve is not closed, and the valve is in Remote-Auto mode, the valve shall be closed.

Position Control:

Manual: The valve can be manually positioned by the operator at the HMI by entering a position percentage setpoint.

Auto: The pump shall be permitted to start against a closed discharge valve. When the pump is called to run, and run status is confirmed, the discharge valve shall be automatically called to open to an HMI adjustable percentage setpoint (normally set at 100%) by the PLC.

When a pump is called to stop (either manually from the PLC or automatically from the PLC, the discharge valve will be called to close. The pump will remain running until the discharge valve position is less than 20% open – at that point the pump will stop and the valve will continue to close fully.

Alarms / Monitoring:

Local (At Valve Actuator):

Valve Position

SCADA PLC/HMI/OIT (via Modbus):

Common Alarm
Channel A Network Fault

Channel B Network Fault
Valve Jammed
High Torque (Opening)
High Torque (Closing)
Valve Operated Manually From Handwheel
Valve in Remote
Valve Open
Valve Closed
Valve Position

SCADA PLC/HMI/OIT (PLC Generated)
Valve Open with Pump Off Alarm

LOOP 520 WASTE ACTIVATED SLUDGE FLOW

General: The WAS pumps shall maintain a flow setpoint of waste activated sludge flowing from the WAS pumping station. The flow setpoint is calculated by the PLC based on a flow setpoint entered by the operator at the HMI. Control shall include manual and automatic open/close operation and position adjustment of the valves. Flow is continuously monitored by means of a magnetic flowmeter

Control:

Local:

None

SCADA PLC/HMI/OIT:

Manual: None

Auto: The operator shall manually enter a "WAS Flow Setpoint" which shall be used as the setpoint of a PID controller (FC-520). The PID controller shall output a pump speed signal between 0-100% using the feedback from the waste activated sludge flow transmitter (FIT-520) as the process variable.

Alarms / Monitoring:

Local (At the Transmitter):

Flow

SCADA PLC/HMI/OIT:

Flow
Totalized Flow (see general criteria above).

LOOP 520 WASTE ACTIVATED SLUDGE PRESSURE

General: The WAS pumps discharge header shall be continuously monitored by means of a pressure transmitter.

Control:
 None

Software Interlock:

 If the high discharge pressure setpoint condition is met, all active pumps will be called to stop, and shall not be permitted to start.

Alarms / Monitoring:

Local (At the Transmitter):

Pressure

SCADA PLC/HMI/OIT:

Pressure
Low-Low Discharge Pressure
Low Discharge Pressure
High Discharge Pressure
High-High Discharge Pressure

LOOP 530 UPS-RASWAS MONITORING

General: The UPS located in the RAS/WAS Control Panel shall be monitored for critical alarms and statuses.

Alarms / Monitoring:

SCADA PLC/HMI:

Hardwired:
On Battery
Low Battery
Common Alarm

END OF SECTION

SECTION 13306
APPLICATIONS ENGINEERING SERVICES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. If referred to anywhere else in the project manual, Application Engineering (AE) or programming services performed by the process control system supplier (PCSS) are those services specified in this Section.
- B. Provide all programming, configuration, and related services required to achieve a fully integrated and operational system as specified herein. All equipment shall be controlled in full conformity with the contract drawings, process control descriptions, specifications, engineering data, instructions, and recommendations of the equipment manufacturer. Coordinate the control system for proper operation with related equipment and materials furnished by other suppliers under other Sections of these specifications and with related existing equipment. Services the PCSS are responsible for shall include, but are not limited to, the following:
 1. The new PLC-RASWAS shall be programmed as specified herein and in Section 13305.
 2. The program for the existing PLC-5 at the WAS/RAS Pump Station (being replaced under this project) contains logic for controlling the WAS Pumps, RAS Pumps, and associated support equipment. The Contractor shall obtain from the Owner the existing PLC program, which was written using RSLogix 5 software. The existing PLC-5 program shall be used as follows:
 - a. The existing PLC-5 program shall be imported into the new RSLogix5000 software provided under Section 13311. The program shall then be modified by the Contractor per the requirements of these specifications.
 - b. The existing PLC I/O schedule is included in Section 13300 as Appendix A. The list includes all existing inputs and outputs for the existing Allen-Bradley PLC-5 and associated Remote I/O (RIO) racks being replaced under this contract. The highlighted signals included on the list are not hardwired – they communicate from the VFDs to the existing PLC via RIO protocol. The communication shall be modified such that these highlighted signals communicate from the VFDs to the new PLC-RASWAS via Ethernet/IP protocol. Additional required VFD signals to be received via Ethernet/IP are listed in 13305.
 - c. The PCSS shall program control logic for the all of the existing I/O signals into the new PLC-RASWAS. With the exception of new control requirements defined herein and in Section 13305, the new PLC-RASWAS shall perform the same functionality as the existing PLC from where the signal was removed.
 - d. It shall be the responsibility of the contractor to ensure that all control strategies in the new PLC-RASWAS (including those for the existing RAS pumps) function properly. Existing logic that was imported as well as newly programmed logic must be fully tested by the contractor per requirements of Section 13302.
 3. Revise graphics on existing PanelView Plus Operator Interface Terminal (OIT) to include modifications required by this section and Section 13305. The existing OIT program shall be obtained from the Owner and then modified by the Contractor per the requirements of

this specification. It shall be the responsibility of the contractor to ensure that all OIT graphics (existing and new) interface properly with the new PLC program (including those for the existing RAS pumps). Existing graphics as well as newly programmed graphics must be fully tested by the contractor per requirements of Section 13302. The PCSS shall be responsible for all modifications of the PanelView Plus graphics without the use of the Owner's software licenses

4. Revise graphics on the existing plant Wonderware Human-Machine Interface (HMI) system to include modifications required by this section and Section 13305. The existing Wonderware application shall be obtained from the Owner and then modified by the Contractor per the requirements of this specification. It shall be the responsibility of the contractor to ensure that all Wonderware graphics (existing and new) interface properly with the new PLC program (including those for the existing RAS pumps). Existing graphics as well as newly programmed graphics must be fully tested by the contractor per Section 13302. The PCSS shall be responsible for all modifications of the Wonderware graphics without the use of the Owner's software licenses.
 5. Wonderware HMI modifications shall include database modification as well as graphic modification. At project completion, all plant Wonderware nodes (servers and client nodes) shall be updated with the modified application.
 6. Provide for and test communications and functionality between the PLC, the PanelView Plus OIT, the existing Wonderware application, and the Variable Frequency Drives (VDFs).
- C. All work shall be coordinated with plant operating personnel to minimize impacts on daily operation. Delays caused for any reason shall be noted and formally submitted to the Engineer and the Owner in the form of a letter.

1.02 RELATED WORK

- A. Refer to Section 13300 "I & C - General Provisions."

1.03 SUBMITTALS

- A. Refer to Section 13300 for Submittal Requirements.

1.04 WARRANTY:

- A. All application work shall be warranted in accordance with Section 01740.

1.05 COORDINATION MEETINGS AND WORKSHOPS

- A. Refer to Section 13300. The meetings below are in addition to the meetings specified in that section.
- B. Schedule and conduct a draft graphics review meeting. The purpose of this meeting shall be to present draft graphics for the Owner's and Engineer's review and feedback prior to creating the full set of graphics for review. For repetitive graphics such as graphics for multiple process trains, include an example of the first graphic only for discussion. Include discussion of process

and overview displays, examples of pop-ups, trends, and system navigation tools. Expect major comments and incorporate any changes resulting from those comments.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. The system specified herein shall perform the following generalized functions:

1. The system shall allow the operator to control equipment such as pumps and valves as shown on the Drawings and as defined in Section 13305 - Control Descriptions.
2. Perform real-time process control, including proportional integral derivative control action, sequencing, process calculations, etc.
3. Collect, calculate, and store accurate, reliable operating information for present and future uses.
4. Assist remote site operating personnel by noting and communicating off normal operating conditions and equipment failures.
5. Accumulate and store equipment running times for use in preventative maintenance.
6. Provide color graphic displays and reports for use by the system operating and supervisory personnel.
7. Provide trending for all analog values.
8. Provide control system diagnostics.
9. All process control functions including PID, calculations, sequencing, timing, etc., shall be done in the process controller. The HMI software shall perform the real-time database, report generation, graphic screens, program development, set point modification, data archiving, etc.
10. The system shall allow the operator to manually control (by keyboard entry and mouse type pointing device) the status of pumps, valves, etc. (i.e., on off, open close, setpoint value, etc.) when viewing the appropriate graphic screen on the HMI.

3.02 CONTROLLER PROGRAMS

- A. All applications programs shall be developed in a structured manner and shall follow an intuitive arrangement so that an instrumentation technician with basic programming knowledge will be able to understand. Programs shall utilize standard program templates or subroutines for repetitive logic such as equipment control, flow total calculations, equipment runtime calculations.

- B. Make changes to the application programs and software configuration, based on comments during the submittals, the factory tests, the field tests, and during the commissioning process to meet the design intent, at no additional cost to the Owner.

3.03 GRAPHIC DISPLAYS - GENERAL

- A. All HMI modifications (PanelView Plus and Wonderware) shall follow the Owner's existing HMI standards. This shall include tag naming conventions, color conventions, standard symbols, animation standards, alarming standards, security configuration, etc.
- B. All displays shall contain and continuously update the displayed process variables, date and time of day. All process values shall be displayed in engineering units. All displays shall incorporate references to both instrumentation tag numbers and plant equipment numbers. All process variables shall be displayed on their associated display(s) with correct engineering units. Process variables shall display their associated data quality flags.
- C. All operator commands related to controlling field devices or system attributes shall require multiple keystrokes or mouse actions to protect against inadvertent operations. The operator shall receive confirmation of the selected point to be controlled, at which time a cancellation of the control can be affected.
- D. Process graphic displays, shall be based on the P&ID's, site plan drawings, mechanical drawings and electrical drawings included in these Contract Documents. The graphic displays shall depict process flow streams, process structures, and all major items of process equipment and control devices in a schematic format.
- E. Unless specifically noted, all timers, setpoints, alarm actuation levels, etc., shall be adjustable from the operator interface.
- F. The system shall show field conditions with text that can alternate (i.e., OPEN/CLOSE, START/STOP, HIGH/LOW) and change color correspondingly. Field devices that are tri state must be represented in three conditions.
- G. Conditions in the field designated as alarm conditions shall report to the operator workstation, actuate an audible alarm, and provide a visual blinking image on the associated graphic page. All alarms and events shall be displayed on the screen and archived.
- H. All interlocks that affect equipment operation shall be identified both in the alarm summary and by HMI graphic indication.
- I. All analog inputs shall be checked for out of range (via high and low limit checks) and alarmed.
- J. All process flow streams shall be labeled and color coded using the project color schedule in Division 9. All structures and equipment shall be identified by name and appropriate equipment and loop tags.
- K. Automatically record all alarm and events should any of the following sequences or events occur:
 - 1. Limit changes

2. Any commanded or uncommanded change of any point
 3. Alarm conditions
 4. Operator login or logout activity
- L. There may be additional general programming requirements listed in Part 1 of the Section 13305 - Control Descriptions that impact the HMI configuration.

3.04 SPECIFIC GRAPHIC SCREENS

- A. At a minimum, provide the following types of graphic screen indicated below.
1. Individual treatment process screens shall graphically screen key process variables and equipment. No operator entries shall be done from these screens. Individual process flow screens for each process shall include all process components, including tanks, pumps, blowers, mixers, drives, flow meters, valves, mechanical devices, as well as manual shutoff and isolation valves. These diagrams shall be generally depicted from the P&ID's and there shall be at least 1 screen per P&ID on average.
 2. Individual unit process screens depicted from the P&ID's are used for control and screen of each major item of process equipment, process variables, and control devices, including pumps, blowers, valves, gates, mixers, drives etc. Navigational buttons shall consist of the P&ID's flow arrows to other individual unit processes. The unit process screens shall provide the ability for the operator to go to individual equipment popup screens. These diagrams shall be generally depicted from the P&ID's and there shall be at least 2 screens per P&ID on average.
 3. Popup screens shall be provided for each piece of equipment to start/stop equipment, open / close valves, implement automatic control, adjust set points, establish and adjust tuning parameters, set alarm limits and initiate a sequence.
 4. PLC system diagnostic screens, showing the operational status, and fault conditions of all PLC components, including processors, I/O modules, OIT's, power supplies and UPS units.
 5. Communications diagnostic screens, showing the details of network status, communications status of all major components including Operator Work Stations, peripheral devices and network components.
 6. Maintenance screens shall screen the raw value for each analog and digital I/O point in the system. They shall also allow the operators/maintenance personnel to enter an override value for an analog point that is then used by the system instead of the value read from the input card / communications link.
 7. Trend screens with the capability to screen up to eight, operator assigned, analog and/or digital process variables. Each analog value will be shown on a trend screen.
 8. Main alarm summary screen shall screen the following information on each alarm: Time, tag name, description, alarm type, current value and status. An acknowledge alarm button shall acknowledge all new unacknowledged alarms. The acknowledged and

unacknowledged alarms shall be different colors. Acknowledged alarms shall clear automatically after the condition is corrected.

3.05 SECURITY

- A. The system shall be configured and implemented with security to prevent unauthorized access. The system shall allow authorized changes to system operation through defined user accounts and password verification. The Owner's existing PanelView and Wonderware security policies shall be followed by the PCSS when modifying the applications for this contract.
- B. Coordinate with Owner user account information, including login name and password for each account.

3.06 TESTING

- A. Refer to 13302.

3.07 TRAINING

- A. Refer to Section 13303 for general training requirements

END OF SECTION

SECTION 13311
PLC HARDWARE AND SOFTWARE

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section includes Programmable logic controllers for control of process equipment, process oriented machinery, and process systems.

1.02 RELATED WORK

- A. Section 13300 "Instrumentation and Controls - General Provisions."

1.03 SUBMITTALS

- A. Refer to Section 13300.
- B. Descriptive literature, bulletins, catalog cuts and Drawings for the equipment specified herein.
- C. Submit list of 3 firms that are located within 100 miles of the project site that are actively installing, programming, supporting, and maintaining the submitted PLC.
- D. Complete bill of materials for the equipment.
- E. Any deviation of the hardware or software systems from the preliminary submittal included in the Project Plan shall be described in detail.
- F. Spare parts list.

1.04 REFERENCE STANDARDS

- A. ASTM D 999-91: Vibration.
- B. (CFR) Title 47, Part 18 (European EN 55011 (formerly CISPR 11)).
- C. CSA Certification Class I, Division 2, Group A, B, C, D Hazardous or non-hazardous locations.
- D. IEC 60068-2.1 Environmental testing – Part 2-1: Tests - Test A: Cold, 2.2 Environmental testing - Part 2: Tests. Tests B: Dry heat, 2.3, 2.6 Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal) and 2.27 Environmental testing. Part 2: Tests. Test Ea and guidance: Shock.
- E. IEC 61000 Electromagnetic compatibility (EMC) - Testing and measurement techniques:
 - 1. Part 4-2: Electrostatic discharge immunity test.
 - 2. Part 4-3: Radiated, radio-frequency, electromagnetic field immunity test.
 - 3. Part 4-4: Electrical fast transient/burst immunity test.

- 4. Part 4-5: Surge immunity test.
- 5. Part 4-6: Immunity to conducted disturbances, induced by radio-frequency fields.
- F. IEC 61131-3: Programmable controllers - Part 3: Programming languages.
- G. IEC 801-3: RFI Immunity.
- H. IEC 801-5: Ground Continuity.
- I. IEC 801-2: Electrostatic Discharge.
- J. IEEE 472-1974/ANSI C37.90/90A-1974 (Surge Withstand) IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus.
- K. MIL STD 461B CS02: RFI/EMI Susceptibility.
- L. NEMA Pub No ICS2-230.42: Showering Arc Test.
- M. NSTA Project 1A.
- N. UL 508 and CSA Standard C22.2 No. 142 (Isolation Voltages).

1.05 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A qualified manufacturer shall be capable of providing training, parts, and coordination of emergency maintenance and repairs.
- B. To be considered for the work under this Section, there shall be at least 3 firms located within 100 miles of the project site that have local staff actively installing, programming, supporting, and maintaining the submitted PLC for the PLC to be considered as an "or equal" to the listed manufacturers.
- C. Programmable controller and all of the corresponding components within the family of controller products shall be manufactured by a company who regularly manufactures and services this type of equipment.
- D. Manufacturer shall comply with ISO9001 standards for "Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing".
- E. Manufacturer shall provide complete technical support for all of the products. This shall include factory or on-site training, regional application centers, local or factory technical assistance, and a 24/7/365 technical support phone service.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver PLC components in packaging designed to prevent damage from static electricity and physical damage.

- B. Store PLC equipment according to manufacturer requirements. At a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. Protect PLCs from exposure to dirt, fumes, water, corrosive substances, and physical damage. Also, protect the PLC from all forms of electrical and magnetic energy that could reasonably cause damage.

1.07 NOMENCLATURE AND IDENTIFICATION DEFINITIONS

- A. AI: Analog Input.
- B. AO: Analog Output.
- C. Fixed I/O: A PLC style consisting of a fixed number of I/O, a processor, and a power supply all in one enclosure. Some fixed PLCs have limited expansion ability.
- D. CPU: Central Processing Unit.
- E. DI: Discrete Input.
- F. Distributed I/O: Hardware specially designed to function as Remote I/O.
- G. DO: Discrete Output.
- H. HMI: Human-Machine Interface.
- I. I/O Input and/or Output.
- J. Master/Slave: Communication between devices in which one device, the master, controls all communications. The other devices, the slaves, respond only when queried by the master. Typically used in a Remote I/O application.
- K. Modular: A PLC style consisting of cards that are assembled to comprise a complete unit. All I/O, CPU, and Power Supply are dedicated cards. Typically, these cards are inserted into a chassis.
- L. Peer to Peer: Communication between two or more devices, typically PLC's, in which each device can control the communication exchange.
- M. PID: Control action, proportional plus integral plus derivative.
- N. PLC: Programmable Logic Controller.
- O. Remote I/O: I/O that is located remotely from the processor. Remote I/O can communicate over a variety of communication protocols and can use standard rack based I/O, or special Remote I/O hardware referred to as Distributed I/O.
- P. SCADA: Supervisory Control and Data Acquisition.

1.08 SPARE I/O AND SLOTS

- A. Each panel containing PLC I/O shall include at least 20 percent (minimum of four) points of each type (AI, AO, DI, and DO) for future use, regardless of whether any of those point types are used in that panel or not. The spares shall be the same type of I/O modules supplied.
- B. For chassis based PLC systems, provide at least two spare slots for addition of future I/O in each chassis provided. For non-chassis based PLC systems, provide adequate space to the right of the last I/O card in each row of I/O cards for at least two future I/O cards (width should be based on the widest I/O card provided in panel).
- C. Spare output points that require the use of an external relay shall be supplied with the external relay.
- D. Regardless of the spare requirement, all installed unused points on all I/O modules shall be wired to terminal blocks in the order that they occur on the I/O modules. Unwired spares shall not be acceptable.

1.09 MANUFACTURER SUPPORT

- A. Provide a written proposal for a manufacturer support agreement for products specified herein for a minimum of 12 months starting at final completion of the project. The cost of this manufacturer support agreement shall not be included in the Contract Price. The support agreement shall be executed in the name of, and for the benefit of, the Owner. At a minimum, this agreement shall provide the Owner with:
 - 1. 8 AM to 5 PM, 5 day per week manufacturer telephone support.
 - 2. Access to the manufacturer's technical support website.
 - 3. Software and firmware updates.

PART 2 PRODUCTS

2.01 CHASSIS BASED PROGRAMMABLE LOGIC CONTROLLER SYSTEM

- A. General:
 - 1. Provide Programmable Logic Controller equipment with the required memory and functional capacity to perform the specified sequence of operation with the scheduled input and output points.
 - 2. Processor Systems shall include processor, power supply, input/output modules, communication modules, redundancy modules, and remote interface modules as required to meet system requirements.
 - 3. Furnish products listed and classified by Underwriters Laboratories (UL), CSA, or FM approval as suitable for purpose specified and indicated.

4. All equipment and devices furnished hereunder shall be designed for continuous industrial service. The system shall contain products of a single manufacturer, insofar as possible, and shall consist of equipment models that are currently in production.
5. All equipment furnished shall be designed and constructed so that in the event of power interruption the systems shall go through an orderly shutdown with no loss of memory, and resume normal operation without manually resetting when power is restored.
6. PLCs shall communicate between the operator workstation and field-mounted transducers, switches, controllers, and process actuators. Communications protocol shall be completely transparent to process operators at the Human Machine Interface (HMI).
7. PLC shall be capable of stand-alone operation in the event of failure of the communication link to the HMI subsystem.
8. Backup Processor Systems, if indicated on the drawings, shall consist of two chassis with power supplies, each containing a processor, redundancy module and communications module(s). Remote chassis shall be provided with communication modules to meet I/O and communication requirements.
9. Remote Input/Output Units shall include input/output modules, interface modules, communication modules, and power supply to meet system input and output requirements.
10. Agency and environmental specifications:
 - a. Electrical supply voltage to the PLC shall be 120VAC, plus or minus "15 percent, 48 - 63Hz. PLC system power supplies shall be fused for overload protection.
 - b. Vibration: 3.5 mm Peak-to-Peak, 5 - 9 Hz: 1.0G, 9 - 150\Hz. The method of testing is to be based upon IEC 68-2-6 and JIS C 0911 standards for vibration. The system is to be operational during and after testing. Vibration Rating of 2.0G maximum peak acceleration for 10 to 500Hz. in accordance with at least one of the following:
 - 1) Installed rating: DIN rail mounted PLC: 10 - 57 Hz, amplitude 0.075 mm, acceleration 25-100 Hz.
 - 2) Panel or plate mounted PLC: 2 - 25 Hz, amplitude 1.6mm, acceleration 25 - 200 Hz.
 - 3) In compliance with IEC 60068 and IEC 61131.
11. Shock: 15G, 11 msec. Method of testing is to be based upon IEC 68-2-27 and JIS C 0912 standards for shock. The system is to be operational during and after testing.
12. Temperature: All PLC hardware shall operate at an ambient temperature of 0° to 60° C (32° to 140° F), with an storage ambient temperature rating of -25° to 70° C (-40° to 185° F).
13. Relative Humidity: Programmable Controller hardware shall function continuously in the relative humidity range of 10 percent to 95 percent non-condensing.
14. Noise Immunity: Programmable Controller system shall be designed and tested to operate in the high electrical noise environment of an industrial plant as governed by the following regulations: IEEE 472, IEC 801, MILSTD 461B, IEC 255-4, NEMA ICS 2-230.40, and ANSI/IEEE C-37.90A-1978.

15. Altitude:
 - a. Operation: 0 - 6,500 feet.
 - b. Storage: 0 - 9,800 feet.
 16. Degree of protection: NEMA 1 (IP20).
 17. All products shall have corrosion protection.
- B. All major assemblies and sub-assemblies, circuit boards, and devices shall be identified using permanent labels or markings indicating:
1. Modules product type such as analog or digital.
 2. Modules catalog number.
 3. Modules major revision number.
 4. Modules minor revision number.
 5. Module manufacturer vendor.
 6. Module serial number.
- C. All necessary cables shall be included. All cables and connectors shall be as specified by the manufacturer. Cables shall be assembled and installed per the manufacturer recommendations.
- D. Central Processing Unit (CPU):
1. CPU shall be, at a minimum, a 16-bit microprocessor that provides system timing and is responsible for scheduling I/O updates, with no user programming required to ensure discrete or analog update. It shall execute user relay ladder logic programs, communicate with intelligent I/O modules, and perform on-line diagnostics. The CPU shall consist of a single module which solves application logic, stores the application program, stores numerical values related to the application processes and logic, and interfaces to the I/O.
 2. CPU shall sample all the discrete and analog inputs and outputs including internal coils and registers, and service special function modules every scan. The CPU shall process the I/O with user program(s) stored in memory, then control the outputs based on the results of the logic operation.
 3. Supply the CPU with a battery-backed time of day clock and calendar.
 4. CPU family shall allow for user program transportability from one CPU model to another.
- E. Diagnostics:
1. CPU shall perform on-line diagnostics that monitor the internal operation of the PLC. If a failure is detected, the CPU shall initiate system shutdown and fail-over. The following, at a minimum, shall be monitored: Memory failure, memory battery low, and general fault,

communications port failure, scan time over run, I/O failure, and analog or special function I/O module failure.

2. All diagnostic information shall be accessible to the host communications interfaces and to the PLC program.
3. PLC shall have indicators and on board status area to indicate the following conditions:
 - a. CPU run.
 - b. CPU error or fault.
 - c. I/O failure or configuration fault.
 - d. Status of Battery or back-up power module.
 - e. Communications indicator.

F. Memory:

1. User program and data shall be contained in non-volatile battery backed memory of type CMOS RAM program memory or equivalent.
2. Memory Backup System: provide lithium battery backup or equivalent capable of retaining all memory for a minimum of three months and a Flash memory system capable of reloading program in the event of memory loss.
 - a. Backup Storage: The backup battery or module shall be capable of being replaced without disrupting memory integrity. Provide a visual indication of low battery voltage or module error and an alarm bit in the PLC program.
 - b. SD Memory Card: Memory card storage capacity shall be greater than processor memory capacity. Memory cards shall be installed in processors for factory testing.
3. Operating system shall be contained in non-volatile firmware. The memory containing the operating system shall be field updateable via a separate update tool.

G. Programming Environment:

1. Programming port: The PLC shall utilize a serial USB or Ethernet port for programming.
2. On-Line programming: Application programs may be modified or stored while the CPU is running, with minimal impact on the scan time.
3. Online programming including runtime editing.
4. IEC 61131-3 programming languages supported: Ladder logic, function block, sequential function chart, and structure text.
5. Supply all hardware and software necessary to program the CPU in these languages.

H. Communication Ports:

1. CPU shall be expandable and supplied with additional modules to support the required communication interfaces.

I. Remote I/O Communications:

1. CPU shall be capable of communicating with up to 12 remote base locations at a combined distance of 2500 feet. The CPU shall automatically sample and update all local and remote I/O modules each scan cycle of the CPU.
2. Communication link between the CPU and any RIO chassis shall be as recommended by the PLC manufacturer. For racks located on a link of less than 2500 cable feet, the speed of the communications link shall be greater than 230K baud with RIO scan rate of less than 5 milliseconds per RIO.
3. Diagnostic and equipment status information shall be available from each RIO.
4. It shall be possible to communicate with remote I/O racks or other PLCs via fiber optic cable.
5. Remote I/O system shall have available a remote input/output arrangement capable of operation at locations physically separated from the PLC CPU as detailed on the drawings.
6. Communication with the remote I/O arrangement shall be through cable as recommended by the PLC manufacturer and provided by the PLC system supplier under this specification Section.

J. Power Supplies:

1. PLC shall have chassis mounted power supplies to power the chassis backplane, and provide power for the processor and applicable modules.
2. Power supplies shall have a clearly visible LED to indicate that the incoming power is acceptable and the output voltage is present.
3. Power supplies shall feature over-current and over-voltage protection and should be designed to operate in most industrial environments without the need for isolation transformers.
4. Power supplies shall be sized to accommodate the anticipated load plus 30%.
5. DC power supplies shall be capable of handling ripple up to 2.4V peak to peak.
6. AC Line Voltage rating of 85 to 265Vac, 47 - 63Hz.
7. Power supplies shall allow for brown outs of at least 1/2 of a cycle, a harmonic rate of 10%, and will sustain continuous operation through momentary interruptions of AC line voltage of 10ms or less.
8. Automatically shut down the Programmable Controller system whenever its output power is detected as exceeding 125% of its rated power.
9. Provide surge protection, isolation, and outage carry-over up to 2 cycles of the AC line.

10. Redundant power supplies will comply with all the requirements of non-redundant power supplies in addition to the features stated below.
 - a. Redundant power supplies shall be designed to share the current required by the chassis. In the event of a failure of one redundant power supply, the remaining supply will accommodate the entire load of the chassis without disruption to the chassis activity.
 - b. Provide a failsafe fuse that is not accessible by the customer.
 - c. Provide a solid state relay connection to allow for failure annunciation when wired to an input module.
 - d. Diagnostic LED status indicators for Power and redundancy.

K. Chassis:

1. PLC system shall be chassis based.
2. All system and signal power to the CPU and support modules shall be distributed on the backplane. No interconnecting wiring between these modules via plug-terminated jumpers shall be acceptable.
3. All system modules, main and expansion chassis shall be designed to provide for free air flow convection cooling. No internal fans or other means of cooling, except heat sinks, shall be permitted.
4. All system modules including the processor shall be removable from the chassis or inserted in to the chassis while power is being supplied to the chassis without faulting the processor or damaging the modules.
5. Modules shall be designed to plug into a chassis and to be keyed to allow installation in only one direction. The design must prohibit upside down insertion of the modules as well as safeguard against the insertion of a module into the wrong slot or chassis via an electronic method for identifying a module. Electronic keying shall perform an electronic check to insure that the physical module is consistent with what was configured.

L. Discrete Input & Output Modules:

1. General:
 - a. Digital input and output modules shall provide ON/OFF detection and actuation.
 - b. I/O count and type shall be as required to implement the functions specified plus an allowance for active spares, as noted below.
 - c. Modules shall be designed to be installed or removed while chassis power is applied.
 - d. Modules shall have indicators to display the status of communication, module health and input / output devices.
 - e. Each module shall have the following status indicators.
 - 1) On/Off state of the field device.
 - 2) Module's communication status.
2. Module Specifications (120VAC Input Module):
 - a. Nominal Input Voltage: 120VACc.
 - b. On-State Current: 15mA @132V AC, 47 - 63Hz maximum.
 - c. Maximum Off-State Voltage: 20V.

- d. Maximum Off-State Current: 2.5mA.
 - e. Number of Points per Card: 16.
3. Module Specification (120 VAC Solid State Output Module):
- a. Each triac type discrete output shall have an associated interposing relay located in the same control panel. 120 VAC power for relay outputs shall be provided from the associated motor starter control circuit (when used with motor starters) or other 120 VAC source (when I/O is not associated with a particular motor starter).
 - b. Output Voltage Range: 74 - 265 VAC, 47 - 63 Hz.
 - c. Output Current Rating:
 - 1) Per Point: 0.5A maximum @ 30 degrees C; 0.25 A maximum @ 60 degrees C; Linear Derating.
 - 2) Per Module: 4A maximum @ 30 degrees C; 2A maximum @ 60 degrees C; Linear Derating.
 - d. Surge Current Per Point: 5A for 43ms each, repeatable every 2s @ 60 degrees C.
 - e. Minimum Load Current: 10mA per point.
 - f. Maximum On-State Voltage Drop: 1.5V peak @ 2.0A and 6V peak @ load less than 50mA.
 - g. Maximum Off-State Leakage: 2.5mA per point.
 - h. Number of Points per Card: 16.
4. Module Specifications (Individually Isolated, Relay Contact Output Module):
- a. Output Voltage Range: 10 - 265 VAC, 47 - 63 Hz, 5 - 125 VDC.
 - b. Output Current Rating:
 - 1) Per Point: 2.5A maximum.
 - 2) Per Module: 16A maximum.
 - c. Power Rating (Steady State): 250 VA maximum for 125 VAC inductive output.
 - d. Maximum Off-State Leakage: 0 mA per point.
 - e. Configurable States:
 - 1) Fault Per Point: Hold Last State, ON or OFF.
 - 2) Program Mode Per Point: Hold Last State, ON or OFF.
 - f. Number of Points per Card: 16.

M. Analog Input & Output Modules:

1. General:
- a. Analog input modules shall convert an analog signal that is connected to the module's screw terminals into a digital value. The digital value representing the magnitude of the analog signal shall be transmitted on the backplane. Analog output modules shall convert a digital value that is delivered to the module via the backplane into an analog signal on the module's screw terminals.
 - b. Modules shall be designed to be installed or removed while chassis power is applied.
 - c. Modules shall have indicators to display the status of communication, module health and input / output devices.
 - d. Each analog module shall provide both hardware and software indication when a module fault has occurred. Each module shall have an LED fault indicator and the programming software shall display the fault information.
 - e. Analog modules shall be software configurable through the I/O configuration portion of the programming software.
 - f. Following status shall be capable of being examined in ladder logic:

- 1) Module Fault Word: Provides fault summary reporting.
 - 2) Channel Fault Word: Provides under-range, over-range and communications fault reporting.
 - 3) Channel Status Words: Provides individual channel under-range and over-range fault reporting for process alarm, rate alarms and calibration faults.
 - g. 24 VDC power for analog instrument loops shall be provided as a part of the system. 24 VDC power supply shall be derived from the 120 VAC input power circuit to the PLC. Field side of the 24 VDC power sources(s) shall have individual or grouped (of logically associated circuits) fusing and be provided with a readily visible, labeled blown fuse indicator.
2. Differential Analog Input Module:
 - a. Input Range: 0-20 mA.
 - b. Resolution: approximately 16 bits across range.
 - c. Input Impedance: Greater than 249 Ohms.
 - d. Overvoltage Protection: 8V ac/dc with on-board current resistor.
 - e. Normal Mode Rejection: 60 dB at 60 Hz.
 - f. Common Mode Noise Rejection: 120 dB at 60 Hz, 100 dB at 50 Hz.
 - g. Isolation Voltage:
 - 1) Channel to Ground/Chassis - 100% tested at 1000 VDC minimum for 1s based on 250 VAC.
 - h. Number of Points per Card: 8.
 3. Isolated Analog Output Current Module:
 - a. Output Current Range: 4 to 20 mA.
 - b. Current Resolution: 12 bits across 20 mA.
 - c. Open Circuit Detection: None.
 - d. Output Overvoltage Protection: 24V ac/dc maximum.
 - e. Output Short Circuit Protection: 20 mA or less (electronically limited).
 - f. Calibration Accuracy: Better than 0.1% of range from 4 mA to 20 mA.
 - g. Calibration Interval: 12 months typical.
 - h. Number of Points per Card: 8.
 4. Communications Interfaces:
 - a. PLC will be capable of the following communication protocols as shown on the drawings:
 - 1) 10BASE-T/100BASE-TX Ethernet communication.
 - 2) Modbus (RTU and ASCII) for up to 247 slaves.
 - 3) Asynchronous serial link capable of communicating up to 19.2 Kbps.
 - 4) Provide a Prosoft Limatorque Valve Network Interface Module Model MVI56-LTQ to interface with the existing valve actuators.
 - b. When required provide a Communications Interface Module mounted in the chassis or the equivalent port directly on the CPU.

N. Manufacturers:

1. The PLC shall be Rockwell Automation: Allen-Bradley 1756 ControlLogix series to match existing plant PLC equipment. No other models shall be acceptable.

2.02 PLC PROGRAMMING SOFTWARE

- A. Provide one PLC configuration and application development software package complete with documentation and disks. A full license shall be included and shall be registered in the Owner's name and address.
- B. Software package shall allow on-line/off-line program development, annotation, monitoring, debugging, uploading, and downloading of programs to the PLCs.
- C. All required hardware (including cables, cable adapters, etc.) for connection to PLCs shall be furnished.
- D. Software package shall include a software license agreement allowing the Owner the right to use the software as required for any current or future modification, documentation, or development of the PLCs furnished for this project.
- E. Software provided shall be capable of the following IEC 61131-3 functions:
 - 1. Ladder logic.
 - 2. Function block.
 - 3. Sequential function chart.
 - 4. Structure text.
- F. In addition to the above editors, an add-on instruction editor shall work with any of the above-mentioned editors to create custom reusable function blocks. This software shall allow any of the derived function blocks to be modified on-line.
- G. Software shall be Microsoft Windows-based and run on the Owner's.
- H. Software shall include a security feature to prevent unauthorized personnel from modifying and downloading the programs.
- I. Manufacturer:
 - 1. The PLC Software shall be the latest revision at the time of submittal of Rockwell Studio 5000 Logix Designer Professional Edition.

2.03 SPARE PARTS

- A. General requirements for spare parts are specified in Section 13300.
- B. The following PLC spare parts shall be furnished:
 - 1. Processors: Provide spare processor unit(s) for each unique processor installed.
 - 2. Memory Cards: Provide spares for each type of card installed.

3. I/O Cards: Provide spares for each unique I/O module type installed. Provide two or 10 percent of installed quantity, whichever is greater.
4. Network interface, remote I/O, and communication modules: Provide one spare communication module for each unique communication module installed.
5. PLC Power supplies: Provide spare power supplies for each unique power supply installed.
6. Chassis: Provide spare chassis for each unique chassis installed.
7. Fixed PLCs: Provide spares for each unique type of PLC installed.
8. Miscellaneous components (including cables): Provide spares for each unique component installed.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION

- A. Maintain area free of dirt and dust during and after installation of programmable controller products.
- B. Anchor PLCs within enclosures as recommended by the PLC manufacturer.
- C. Ventilation slots shall not be blocked, or obstructed by any means.
- D. Examine areas, surfaces, and substrates to receive PLCs for compliance with requirements, installation tolerances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. Install in accordance with manufacturer's instructions.
- F. Unload, unpack and transport equipment to prevent damage or loss.
- G. Replace damaged components as directed by Engineer.

3.02 SUBPANEL LAYOUT

- A. Coordinate size and configuration of enclosure to meet project requirements. Drawings indicate maximum dimensions for PLCs, minimum clearances between PLCs, and adjacent surfaces and other items.
- B. Comply with indicated maximum dimensions and clearances, or with PLC vendors required distances if they are greater than the distances indicated.
 1. Provide spacing around PLC as required by the PLC manufacturer to ensure adequate cooling. Insure that the air surrounding the PLC has been conditioned to maintain the required temperature and humidity range.

2. Wires entering and exiting PLC components shall be sized to comply with the PLC manufacturers requirements. Doors on all components shall be able to be fully closed when all the wires are installed.
 3. For chassis mounted PLCs, no wiring, wire ducts, or other devices shall obstruct the removal of cards from the rack.
 4. PLC lights, keys, communication ports, and memory card slots shall be accessible at all times. Lights shall be visible at all times when enclosure door is opened.
- C. Control panel designer shall provide independent line fuses or circuit breakers, per the PLC manufacturer recommendation, for each power supply, input module, output module, and other modules with separately derived power requirements.
- D. Control panel designer shall insure that communication signals, 4-20 mA signals (including those with embedded HART), are properly conditioned for the PLC and protected from all sources of radiated energy or harmonics.
- E. PLC (including all I/O) shall be powered from the UPS power conditioning system in Section 13335.
- F. Where multiple sets of mechanical equipment are provided for process redundancy, arrange their field connections to I/O modules so that the failure of a single I/O module will not disable the redundant system. This applies to all I/O types. The acceptability of the I/O arrangement shall be at the discretion of the engineer.
- G. Provide all required cables, cords, and connective devices for interface with other control system components.

END OF SECTION

SECTION 13330
CONTROL PANEL ENCLOSURES AND PANEL EQUIPMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Refer to Section 13300.
- B. Furnish and install control panels and panel mounted equipment as specified herein and shown on the Drawings.
- C. Each panel and sub-panel shall be supplied with the minimum specified dimensions regardless of the quantity of mounted components inside the panel. All panel mounted components shall be mounted on the single rear-of-panel sub-panel unless the density of devices exceeds the panel mounting space permitted by the minimum panel dimensions specified. Side panel mounted components shall only be permitted after review and approval of the Engineer.
- D. Furnish the following subpanel.

SUBPANEL SCHEDULE

Panel Designation	Maximum Subpanel Space Available	Rating & Type
PLC-RASWAS Subpanel	24-inch wide by 70-inch high	12-gauge; Steel; White polyester powder paint

PANEL SCHEDULE

Panel Designation	Minimum Panel Size	Maximum Panel Size	Rating & Type
OIT-RASWAS	20-inch wide by 20-inch high by 6-inch deep	24-inch wide by 24-inch high by 8-inch deep	NEMA 4X 316L Stainless Steel, Front Access only with clamps, wall mounted

1.02 RELATED WORK

- A. Refer to Section 13300 "I & C - General Provisions."

1.03 SUBMITTALS

- A. Refer to Section 13300.

1.04 COORDINATION MEETINGS

- A. Refer to Section 13300.

1.05 REFERENCE STANDARDS

- A. Refer to Section 13300.

1.06 QUALITY ASSURANCE

- A. Refer to Section 13300.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 13300.

1.08 NOMENCLATURE AND IDENTIFICATION

- A. Refer to Section 13300.

1.09 WARRANTY

- A. Refer to Section 13300.

PART 2 PRODUCTS

2.01 GENERAL

- A. Refer to Section 13300.

2.02 LIGHTNING/SURGE PROTECTION

- A. Refer to Section 13300.

2.03 CONTROL SUBPANEL - CONSTRUCTION

- A. Electrical Wiring
 1. All interconnecting wiring shall be stranded, type MTW, and shall have 600 volt insulation and be rated for not less than 90 degrees Celsius. Wiring for systems operating at voltages in excess of 120 VAC shall be segregated from other panel wiring either in a separate section of a multi-section panel or behind a removable Plexiglas or similar dielectric barrier. Panel layout shall be developed such that technicians shall have complete access to 120 VAC and lower voltage wiring systems without direct exposure to higher voltages.
 2. Power distribution wiring on the line side of fuses or breakers shall be 12 AWG minimum. Control wiring on the secondary side of fuses shall be 16 AWG minimum. Electronic analog circuits shall utilize 18 AWG shielded, twisted pair, cable insulated for not less than 600 volts.
 3. Power and low voltage DC wiring systems shall be routed in separate wireways. Crossing of different system wires shall be at right angles. Different system wires routed parallel to each other shall be separated by at least 6-inches. Different wiring systems shall terminate

on separate terminal blocks. Wiring troughs shall not be filled to more than 60 percent visible fill.

4. Terminations
 - a. All wiring shall terminate onto single tier terminal blocks, where each terminal is uniquely and sequentially numbered. Direct wiring between field equipment and panel components is not acceptable.
 - b. Terminal blocks shall be arranged in vertical rows and separated into groups (power, AC control, DC signal). Each group of terminal blocks shall have a minimum of 25 percent spares.
 - c. Terminal blocks shall be the compression type, fused, unfused, or switched as shown on the Contract Drawings or specified elsewhere in Division 13.
 - d. Discrete inputs and outputs (DI and DO) shall have two terminals per point with adjacent terminal assignments. All active and spare PLC and controller points shall be wired to terminal blocks.
 - e. Analog inputs and outputs (AI and AO) shall have three terminals per shielded pair connection with adjacent terminal assignments for each point. The third terminal is for shielded ground connection for cable pairs. Ground the shielded signal cable at the PLC cabinet. All active and spare PLC and controller points shall be wired to terminal blocks.
 - f. Wire and tube markers shall be the sleeve type with heat impressed letters and numbers.
 - g. Only one side of a terminal block row shall be used for internal wiring. The field wiring side of the terminal shall not be within 6-inches of the side panel or adjacent terminal or within 8-inches of the bottom of free standing panels, or within 3-inches of stanchion mounted panels, or 3-inches of adjacent wireway.
 - h. Circuit power from the SCADA cabinet out to field devices (switches, dry contacts etc.) that are used as discrete inputs to the PLC input cards shall be isolated with an isolating switch terminal block with flip cover that is supplied with a dummy fuse. Isolation switch block shall be an Allen Bradley Model 1492-H7 or equal. One isolating switch terminal block per loop numbered piece of equipment and one per spare I/O point is acceptable.
 - i. All PLC discrete outputs to the field shall be isolated with an isolating fuse switch terminal block with a flip cover and a neon blown fuse indicator. The single circuit fusible terminal block shall be an Allen Bradley 1492-H4 or equal.
5. All wiring to hand switches and other devices, which are live circuits independent of the panel's normal circuit breaker protection, shall be clearly identified as such.
6. All wiring shall be clearly tagged and color coded. All tag numbers and color coding shall correspond to the panel wiring diagrams and loop drawings prepared by the PCSS. All power wiring, control wiring, grounding, and DC wiring shall utilize different color insulation for each wiring system used. The color coding scheme shall be:
 - a. Incoming 120 VAC Hot - Black
 - b. 120 VAC Hot wiring downstream of panel circuit breaker – Red
 - c. 120 VAC Hot wiring derived from a UPS system – Red with Black stripe
 - d. Three phase power – Brown, Orange, Yellow, and Green ground or as specified in Division 16.
 - e. 120 VAC neutral - White
 - f. Ground - Green

- g. DC power or control wiring – Blue
 - h. DC analog signal wiring – Black (+), White (-)
 - i. Foreign voltage – Yellow
7. Provide surge protectors on all incoming power supply lines at each panel per the requirements of Section 13300.
 8. Each field instrument furnished under Division 13 and shown on the Drawings as deriving input power from the control panel(s) shall have a separate power distribution circuit with a circuit breaker or fuse and blown fuse indication. All instruments requiring 120VAC power shall be powered from the UPS source in the panel where the instrument signals lands.
 9. Provide redundant 24 VDC power supplies to power field instruments and panel devices. Twenty-four VDC power supplies shall be as specified in this Section.
 10. Wiring trough for supporting internal wiring shall be plastic type with snap-on covers. The side walls shall be open top type to permit wire changing without disconnecting. Trough shall be supported to the subpanel by stainless steel screws. Trough shall not be bonded to the panel with glue or adhesives.
 11. Each panel shall have a single tube, fluorescent light fixture, 20 Watt in size, mounted internally to the ceiling of the panel. Light fixture shall be switched and shall be complete with the lamp.
 12. Each panel shall have a specification grade duplex convenience receptacle with ground fault interrupter, mounted internally within a stamped steel device box with appropriate cover. Convenience receptacle shall not be powered from a UPS and shall be protected by a dedicated fuse or circuit breaker.
 13. Each panel shall be provided with an isolated copper grounding bus for all signal and shield ground connections. Shield grounding shall be in accordance with the instrumentation manufacturer's recommendations.
 14. Each panel shall be provided with a separate copper power grounding bus (safety) in accordance with the requirements of the National Electrical Code.
 15. Each panel shall have control, signal, and communication line surge suppression in accordance with Section 13300.
 16. All microprocessor-based electronic devices in the panel that are powered by 120VAC shall be powered by the UPS (refer to appropriate Section in Division 13).
 17. Each panel shall be provided with a circuit breaker to interrupt incoming power.
 18. Additional electrical components including transformers, motor starters, switches, circuit breakers, etc. shall be in compliance with the requirements of Division 16.

- B. Relays not provided under Division 16 and required for properly completing the control function specified in Division 13, Division 16, or shown on the Drawings shall be provided under this Section.
- C. The orientation of all devices including PLC and I/O when installed shall be per the manufacturer's recommendations. No vertical orientation of PLC racks shall be allowed unless specifically indicated by the manufacturer as an acceptable mounting alternative and also approved by the engineer.
- D. specification for the mechanical equipment with which the control panel is supplied.

2.04 INTRINSIC SAFETY BARRIERS

- A. Type:
 - 1. Barriers shall be of the solid state electronic type in which the energy level of the sensing or actuation circuit is low enough to allow safe usage in hazardous areas.
 - 2. Provide a barrier for instrumentation and equipment transmitting analog or digital signals that originate in a hazardous area as indicated in the design documents.
- B. Options Required:
 - 1. Barriers shall match power supply provided.
 - 2. Barriers shall be located in non-hazardous areas.
- C. Manufacturer(s):
 - 1. Siemens Water Technologies – IS1 (4-20mA) and IS6 (dry contacts)
 - 2. Gems – 54800 (4-20mA) and 65800 (dry contacts)
 - 3. R. Stahl - Intrinspak
 - 4. Equal.

2.05 24 VDC POWER SUPPLIES

- A. Provide a 24 VDC power supply in the control panel to power field instruments, panel devices, etc., as required. Equip the power supply with a power on/off circuit breaker.
- B. The 24 VDC power supply shall meet the following requirements:
 - 1. Input power: 115 VAC, plus or minus 10 percent, 60 Hz.
 - 2. Output voltage: 24 VDC.
 - 3. Output voltage adjustment: 5 percent.
 - 4. Line regulation: 0.05 percent for 10 volt line change.

5. Load regulation: 0.15 percent no load to full load.
 6. Ripple: 3 mV RMS.
 7. Operating temperature: 32 to 140 degrees Fahrenheit.
- C. Size the 24 VDC power supply to accommodate the design load plus a minimum 25 percent spare capacity.
- D. Provide output overvoltage and overcurrent protective devices with the power supply to protect instruments from damage due to power supply failure and to protect the power supply from damage due to external failure.
- E. Mount the 24 VDC power supply such that dissipated heat does not adversely affect other panel components.
- F. Manufacturer(s):
1. Acopian.
 2. Lambda.
 3. Equal.

2.06 SPARE PARTS

- A. General requirements for spare parts are specified in section 13300.
- B. The following control panel spare parts shall be furnished:
1. Relays and sockets - Two of each type installed.
 2. Fuses and circuit breakers - 10% (minimum of 10 fuses and 2 circuit breakers) of each type and size installed.
 3. Light bulbs - 10% (minimum of 10) of each type installed. For LED type lights, 5% (minimum of 3) of each color installed.
 4. Panel Mounted power supplies - one of each type installed.

PART 3 EXECUTION

3.01 INSTALLATION

- A. The panels shall be installed at locations as shown on the Contract Drawings.
- B. Refer to Section 13300.

3.02 TESTS

- A. Refer to Section 13300.

END OF SECTION

SECTION 13335
CONTROL PANEL UNINTERRUPTIBLE POWER SUPPLY (SINGLE-PHASE)

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Labor, equipment, supervision and materials for the installation, testing, startup, and training for the uninterruptible power supply (UPS) as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Section 16000 – Electrical – General Provisions.
- B. Section 16141 – Wiring Devices.
- C. Section 16950 – Electrical Acceptance Tests.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Sections 01300 and 13300. Submittals shall include shop drawings and product data, for the following:
 - 1. Product brochure.
 - 2. Bill of materials listing all components provided.
 - 3. Deviation list indicating all proposed exceptions.
 - 4. Power single line and control schematics drawings. External connection details and their terminal block locations shall be fully detailed. Internal wiring shall include terminal numbers and color coding.
 - 5. UPS performance specifications:
 - a. kVA rating.
 - b. Input and output voltage and phase.
 - c. Run time at full and half load.
 - d. Voltage (output regulation, input tolerance, unbalance, transfer/retransfer voltage, etc.).
 - e. Heat rejection.
 - 6. Operating Instruction manuals and recommended replacement parts.
 - 7. Name, address, and telephone number of the nearest service facility.
 - 8. Training agenda and information per Section 01758.
 - 9. Battery specifications and warranty.
 - 10. UPS Loading and battery sizing calculations to support runtimes as specified herein.

1.04 REFERENCE STANDARDS

- A. ANSI C62.41/IEEE 587 - Standards for Surge Withstandability.
- B. FCC (Federal Communications Commission) Rules and Regulations, Part 15, Subpart B, Class A certified compliance.
- C. UL (Underwriters Laboratories) 1778 Listed (Rev. Jan 5, 2000), UL497A.
- D. CSA 22.2, No. 107.1 M95 AND 107.2.
- E. IEC 62040-2 Emission and Immunity.
- F. IEC 62040-3 (Uninterruptible Power Systems, Part 3).
- G. EN 60529 Equipment Protection.
- H. National Electric Code (NFPA-70).
- I. ISO 9001.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Provide delivery, storage and handling in accordance with Section 01600 and per the following:
 - 1. Store equipment indoors in a clean, dry, heated storage facility until ready for installation. Do not install equipment in its final location until the facilities are permanently weather tight. Furnish, install and wire temporary electric space heaters in the equipment until permanent heating equipment is operational. Protect equipment at all times from exposure to moisture and chemicals.

1.06 QUALITY ASSURANCE

- A. UPS systems shall utilize a field proven design. UPS manufacturer shall demonstrate at least ten years of continuous field operating experience with equipment of similar size and design.
- B. A factory authorized service and parts organization shall be located within 100 miles of project location. Submit name and address of factory authorized service and parts organization. Manufacturer shall have a complete selection of service options that may include onsite service by factory-employed service engineers and factory depot quick-return service plan options.
- C. Equipment shall be UL or ETL labeled.
- D. UPS manufacturer shall have ISO 9001 certification.
- E. UPS system shall meet or exceed theoretical Mean-Time-Between-Failures (MTBF) for a Single module UPS operation (represents UPS module operation only) of 140,000 MTBF hours.

1.07 WARRANTY

- A. Refer to Section 01740.

- B. UPS: In addition to basic warranty, UPS manufacturer shall provide a standard warranty for UPS for a period of one year from date of purchase. Contractor shall provide an additional one year extended warranty to cover delays associated with equipment startup or date of receipt by end user, whichever occurs first.
- C. Battery: In addition to basic warranty, UPS manufacturer shall provide a standard warranty for batteries for a period of one year from date of purchase. Contractor shall provide an additional one year extended warranty to cover delays associated with equipment startup or date of receipt by end user, whichever occurs first.

PART 2 PRODUCTS

2.01 SINGLE-PHASE UPS

A. System Description:

1. Provide a continuous-duty, on-line, solid state, dual conversion, single-phase input (using input voltage as shown on the Drawings), single-phase 120VAC true sinewave output uninterruptible power system.
2. UPS shall provide power conditioning and power backup for computer, communication, and other critical electronic loads as indicated on Drawings.
3. UPS system shall consist of the following major components:
 - a. Rectifier and battery charger.
 - b. Inverter.
 - c. Batteries and battery disconnect switch.
 - d. Automatic static bypass switch.
 - e. Integral control and monitoring panel.
 - f. Other features as described in this Section and as indicated on Drawings.
4. UPS shall be manufactured by one of the following:
 - a. Eaton Powerware.
 - b. Schneider Electric APC Smart-UPS.
 - c. Or equal.

B. General Requirements:

1. External Battery Enclosure: A separate enclosure shall be provided for housing additional batteries if required to provide minimum run time as specified herein. Battery enclosure shall match main UPS enclosure in style and color.
2. Cabling required to interconnect all components of UPS system shall be provided by UPS manufacturer.
3. Battery protection shall be provided an internal circuit breaker disconnect. Battery cabinets shall be protected by an internal circuit breaker.
4. Current limiting circuitry shall protect inverter output under any load condition. High speed semiconductor fusing shall protect static bypass in event of an output short circuit.

5. AC output neutral shall be electrically isolated from UPS chassis. UPS chassis shall have an equipment ground terminal. Provisions for installation of a bonding connector shall be provided.
6. UPS shall be suitable for installation at the location as shown on Drawings.

C. Performance Requirements - Ratings:

1. Battery runtime: Provide batteries to support 100% of calculated load for 20 minutes. Provide additional batteries in separate enclosure as required to meet runtime requirement.
2. Output power: Provide minimum recommended kVA ratings for the following UPSs in order to supply control panels and ancillary equipment shown on Control System Architecture Diagram and P&IDs. Confirm UPS ratings below per UPS submitted load calculations, spare capacity, and runtime requirements as specified herein.
 - a. UPS-RASWAS: 1.0 kVA, 120 VAC single-phase input, 120 VAC single phase output.

D. Performance Requirements - Environment:

1. Ambient temperature: 0 to 40 degrees C.
2. Elevation: Project site elevation.
3. Relative humidity: 0 to 95 percent non-condensing.

E. Electrical Requirements:

1. System Input - Primary source:
 - a. Single input: Nominal Input Voltage: 120 VAC.
 - b. Frequency: 60 Hertz plus or minus five percent.
 - c. Input Power Factor: 0.96 lag minimum, 50 to 100 percent load.
 - d. Input Current Total Harmonic Distortion (THD): <33 percent.
 - e. Input Surge Withstandability: Per IEEE 587/ANSI C62.41. Category A and B, (6 kV).
 - f. Input Connection: Use existing incoming power to existing control panel.
2. System Output:
 - a. Nominal Output Voltage: 120 VAC.
 - b. Frequency: 60 Hertz plus or minus 3 Hertz.
 - c. 100 percent load with 3:1 Crest Ratio.
 - d. Frequency Slew Rate: 1 Hz/second. (Adjustable at startup).
3. AC to AC Efficiency: (100 percent load @ rated PF): 91 percent.
4. Acoustical Noise: Noise generated by UPS under normal operation shall not exceed 65 dBA (60 dBA typical) at one meter from any surface, measured at 25 degrees C (77 degrees F) and full load.

5. EMI Suppression: UPS shall meet FCC Rules and Regulation 47, Part 15, Subpart B, for Class A devices.

F. Modes of Operation:

1. Normal Mode: UPS shall be a continuous online unit. Power to critical loads shall be continuously generated by inverter during normal AC line power. In event of AC line power failure, power to inverter is supplied by batteries. Under normal operation, batteries shall be charged in a manner that optimizes battery life. Simple "trickle charge" of batteries shall not be acceptable.
2. Bypass Mode: Automatic bypass shall transfer critical load to commercial AC source, bypassing UPS' inverter/rectifier, in case of an overload, load fault, or internal failure.

G. Controls:

1. Microprocessor-controlled circuitry: Fully automatic operation of UPS shall be provided through use of a microprocessor-based controller. All operating and protection parameters shall be firmware-controlled. Logic shall include system test capability to facilitate maintenance and troubleshooting. Startup, battery charging, and transfers shall be automatic functions.
2. Graphical Display: UPS control panel shall utilize an LED graphical display for all UPS control, monitoring, alarming, configuration and diagnostic functions. Following operational controls and indicators shall be provided on UPS control panel per following KVA ranges:

H. Controls:

1. UPS On/Alarm Silence/Manual Battery Test control.
2. Standby/Manual Bypass control.

I. Indicators:

1. LED Battery Meter.
2. Battery in operation status.
3. Load on Inverter status.
4. Load on By-Pass status.
5. AC input status.
6. UPS malfunction alarm.

- J. Remote alarm and status indication: Isolated SPDT Form C dry contacts shall be provided to indicate UPS status for remote monitoring. Contacts shall be rated for 250VAC @ 5A or 30VDC @ 5A. Individual contacts shall be provided for separate annunciation of the following alarm and status conditions:

1. UPS Common Alarm
2. UPS in bypass mode.
3. UPS using battery to power the load.

K. Rectifier/Charger:

1. Term rectifier/charger shall denote solid-state equipment and controls necessary to convert incoming AC power to regulated DC power for input to inverter and for battery charging. Rectifier/charger shall be a solid-state SCR/IGBT power transistor type with constant voltage/current limiting control circuitry.

L. Inverter:

1. Inverter shall include all solid-state equipment and controls to convert DC power from rectifier/charger or battery to a regulated AC power for powering the critical load. Inverter shall use Insulated Gate Bipolar Transistors (IGBTs) in a phase-controlled, pulse width modulated (PWM) design capable of providing specified AC output.
2. Inverter shall be capable of supplying current and voltage for overloads exceeding 100 percent. Inverter is to provide 150 percent of full load for 30 seconds and 125 percent of full load for 2 minutes. A status indicator and audible alarm shall indicate overload operation. UPS shall transfer the load to bypass when overload capacity is exceeded.
3. Output voltage shall be maintained to within plus or minus 4 percent.
4. Output voltage total harmonic distortion (THD) shall not be greater than 5 percent for all loads. For 100 percent rated load of 3:1 crest factor nonlinear loads, output voltage total harmonic distortion shall not be greater than 4 percent. Output rating shall not be derated in kVA or kW due to the 100 percent nonlinear load with 3:1 crest factor.
5. Inverter shall use software control to adjust output voltage from plus or minus 5 percent of nominal value.

M. Batteries:

1. Batteries shall be VRLA (valve-regulated lead-acid), sealed, maintenance-free, high-rate discharge, lead-acid cells suitable for use indoors with no off-gassing or water addition requirements. Batteries shall not require special ventilation. Battery shall consist of one or more battery banks with number of cells required to meet requirements of the rest of these specifications.
2. Battery Design Life: five years.
3. Run time operation of UPS shall be accomplished using batteries mounted within UPS enclosure and supplemented as required with an external battery enclosure to provide battery runtime specified.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install and connect equipment in accordance with manufacturer's instructions.
- B. Remove temporary lifting angles, lugs, and shipping braces.
- C. Touch up damaged paint finishes.

3.02 FACTORY TESTING

- A. Prior to shipment, complete UPS system shall undergo manufacturer's standard factory test.

3.03 FIELD TESTING

- A. Perform the following minimum test and checks:
 - 1. Verify that connections are completed in accordance with shop drawings.
 - 2. Verify supply voltage and phase sequence are correct.
 - 3. Check mechanical interlocks for proper operation.
 - 4. Test ground connections for continuity and resistance.
 - 5. Check control circuit interlocking and continuity.
- B. Submit test plan for review and approval.
- C. Contractor shall include testing of battery runtime under full load with loss of AC power.
- D. Perform all additional tests required by Section 16950 Electrical Acceptance Testing.
- E. In the event of an equipment fault, notify Engineer immediately. After cause of fault has been identified and corrected, a joint inspection of equipment shall be conducted by Contractor, Engineer, and equipment manufacturer's factory service technician. Repair or replace equipment as directed by Engineer.

3.04 ADJUSTMENT

- A. Make UPS adjustments necessary for manual and automatic operation of entire system.

3.05 CLEANING

- A. Remove rubbish and debris from inside and around equipment. Remove dirt, dust, or concrete spatter from interior and exterior of equipment using brushes, vacuum cleaner, or clean, lint free rags. Do not use compressed air.

3.06 TRAINING

- A. Provide training of staff in accordance with Section 01758 and Section 13303.

END OF SECTION

SECTION 13340
INSTRUMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section covers the furnishing, installation, and services for instruments.

1.02 RELATED WORK

- A. Refer to Section 13300 "I & C - General Provisions."
- B. Section 13341 – Flow Devices
- C. Section 13343 – Pressure Devices.

1.03 SUBMITTALS

- A. Submit complete documentation of all field instruments using ISA-TR20.00.01-2001 (updated in 2004-2006) data sheet formats. Submit a complete Bill of Materials (BOM) or Index that lists all instrumentation equipment. The list shall be sorted by Loop Number.
- B. Submit separate data sheets for each instrument including:
 - 1. Plant Equipment Number and ISA tag number per the Drawings.
 - 2. Product (item) name used herein and on the Drawings.
 - 3. Manufacturer's complete model number.
 - 4. Location of the device.
 - 5. Input - output characteristics.
 - 6. Range, size, and graduations in engineering units.
 - 7. Physical size with dimensions, enclosure NEMA classification and mounting details in sufficient detail to determine compliance with requirements.
 - 8. Materials of construction for enclosure and wetted parts.
 - 9. Instrument or control device sizing calculations where applicable.
 - 10. Certified calibration data for all flow metering devices.
 - 11. Two-wire or four-wire device type as applicable.
- C. Submit catalog cuts for all instruments. Submit descriptive literature for each hardware component, which fully describes the units being provided.

- D. Submit index and data sheets in electronic format as well as hard copies on 8-1/2" x 11" formats. Electronic format shall be in Microsoft Excel or Word. Submit electronic copy on CD-ROM or DVD disk.

1.04 MAINTENANCE

- A. Refer to Section 13300.
- B. Test equipment:

1.05 INSTRUMENT TAGS

- A. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as indicated in the Drawings, shall be provided on each piece of equipment supplied under this Section and related sections. Equipment shall be tagged before shipping to the site.
- B. Provide 1/8-in by 3/8-in, Type 316 stainless steel button head machine screws.
- C. All supplied instrument transmitters and instrument transmitter elements shall have a stainless steel identification tag attached to each transmitter and element prior to shipment. Tag shall be attached via stainless steel chain or stainless steel wire (24 gauge min) to a non-removable part of the device. The tag size shall be a minimum of 1.5 square inches. Tag shall include the ISA alphanumeric instrument number as indicated in the P&ID, loop, and detail drawings. The alphanumeric instrument number shall be stamped into the tag and shall have a minimum of 3/16-in high alphanumeric characters.

1.06 APPROVALS/CERTIFICATIONS

- A. Instruments for hazardous locations shall have Factory Mutual (FM), Canadian Standards Association (CSA), and CENELEC approvals and certifications as specified herein and as indicated on the Drawings or in the Instrument Device Schedule. The instrument specifications in Part 2 state the Class, Division, and gas groups for FM/CSA approval, followed in parenthesis by the CENELEC certification; however, instruments provided are only required to have the approval/certification stated above. The instrument shall have a stainless steel tag identifying the relevant approval or certification.

PART 2 PRODUCTS

2.01 INSTRUMENTS

- A. List of required instrumentation is specified in Section 13300.

2.02 SPARE PARTS AND ACCESSORIES

- A. General requirements for spare parts are specified in Section 13300.
- B. Furnish following field Instrument related Spare Parts:
 - 1. One flow switch for each type of flow switch provided.

C. Furnish following Accessories:

1. All mounting hardware required for pipe stand, surface, or other mounting.
2. Each instrument shall be provided with a manufacturer installed stainless steel tag identifying the instrument tag number.

PART 3 EXECUTION

3.01 GENERAL

- A. See execution requirements in Section 13300.

END OF SECTION

SECTION 13341
FLOW DEVICES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section covers the furnishing, installation, and services for flow related instruments as detailed on the Drawings.

1.02 RELATED WORK

- A. Refer to Section 13300 "I & C - General Provisions."

1.03 SUBMITTALS

- A. Refer to Sections 13300 and 13340.

1.04 REFERENCE STANDARDS

- A. Refer to Section 13300.

1.05 SYSTEM DESCRIPTION

- A. N/A

1.06 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 13300.

1.07 COORDINATION MEETINGS

- A. Refer to Section 13300.

1.08 QUALITY ASSURANCE

- A. Refer to Section 13300.

1.09 NOMENCLATURE AND IDENTIFICATION.

- A. Refer to Section 13300.

1.10 MAINTENANCE

- A. Refer to Section 13300.

- B. Test Equipment:

1.11 SPARE PARTS AND ACCESSORIES

- A. See Section 13340 for spare parts requirements.

- B. All mounting hardware required for pipe stand, surface, or other mounting shall be provided.
- C. Each instrument shall be provided with a manufacturer installed stainless steel tag identifying the instrument tag number.

1.12 APPROVALS/CERTIFICATIONS

- A. Instruments specified herein shall meet at a minimum, the National Electrical Manufacturers Association (NEMA) rating for non-hazardous locations listed with each instrument. Those instruments that are submerged in a liquid or are located in submersible area shall also meet NEMA 6 ratings approval. All instruments that are located in hazardous areas as indicated on the Electrical Classification Drawings or in the Instrument Device Schedule shall meet the Factory Mutual (FM), Canadian Standards Association (CSA), and CENELEC Class, Division and Group approvals and certifications listed for that area. The instrument shall have a stainless steel tag identifying the relevant approval or certification

PART 2 PRODUCTS

2.01 MAGNETIC FLOWMETER

A. Flow Element

1. Type:
 - a. Pulsed DC type.
2. Function/Performance:
 - a. Operating Temperature: Process liquid temperatures of 0 to 140 degrees F or greater dependent upon liner and an ambient of minus 30 to 150 degrees F.
 - b. Radio Frequency Interference (RFI) protection: RFI protection shall be provided as recommended by the manufacturer.
 - c. Pressure rating: Equal to piping system where meter is installed.
 - d. Additional: Meter shall be capable of running empty indefinitely without damage to any component.
3. Physical:
 - a. Metering Tube: Type 304 stainless steel or equivalent.
 - b. Flanges: ANSI 150 lb. or DIN PN 16 carbon steel, as required by the piping system, unless otherwise indicated. ANSI 150 lb. or DIN PN 16 stainless steel flanges shall be used on all SS process pipes.
 - c. Liner: Polyurethane or composite elastomer unless otherwise indicated on the Drawings or in the Instrument Device Schedule.
 - d. Electrodes: Type 316 stainless steel standard minimum requirements. All electrodes to be compatible with process fluid as indicated on the Drawings or electrodes to be supplied as listed in the Instrument Device Schedule.
 - e. For sludge, polymer, or any slurry application where the electrodes will be coated, a self-cleaning or a removable electrode option must be provided with that meter.
 - f. Housing: For meters with remote mounted transmitters, meters below grade shall be suitable for submergence for up to 48 hours to a depth of 30 ft (9m). Meters above grade shall be NEMA 4X (IP65). Where hazardous areas are indicated on the Drawings, the equipment shall be rated for that area.

C. Manufacturer:

1. Endress & Hauser Promag 53 Series
2. Toshiba MountAnywhere
3. ABB Instruments WaterMaster.
4. Siemens Sitrans FM MAG.
5. Rosemount Series 8705 Meter.
6. Krohne Optiflux 4000 Series.

2.02 FLOW SWITCH

A. Type:

1. Float Measuring Principle

B. Function/Performance:

1. Output: Normally Open Contact, rated for 3 amps/250 volts AC.
2. Accuracy: 5% of full scale.
3. Flow Range: 15-200 GPH

C. Physical:

1. Material: Stainless Steel
2. Wetted Parts:
 - a. Spring: Stainless Steel
 - b. Gasket: FKM (Fluoroelastomer)
3. Line Size: ½-inch
4. Operating Pressure Max: 300 Bar
5. Ingress Protection: IP65 Minimum

D. Manufacturer(s):

1. Sure Flow Products: DUM/A Series
2. Equal.

PART 3 EXECUTION

3.01 GENERAL

- A. See execution requirements in Section 13300.

END OF SECTION

SECTION 13343
PRESSURE DEVICES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. This Section covers the furnishing, installation, and services for pressure related instruments as detailed on the Drawings.
- B. Refer to Section 13300.

1.02 RELATED WORK

- A. Refer to Section 13300 "I & C - Provisions."

1.03 SUBMITTALS

- A. Refer to Sections 13300 and 13340.

1.04 REFERENCE STANDARDS

- A. Refer to Section 13300.

1.05 SYSTEM DESCRIPTION

- A. N/A

1.06 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section 13300.

1.07 COORDINATION MEETINGS

- A. Refer to Section 13300.

1.08 QUALITY ASSURANCE

- A. Refer to Section 13300.

1.09 NOMENCLATURE AND IDENTIFICATION.

- A. Refer to Section 13300.

1.10 MAINTENANCE

- A. Refer to Section 13300.

1.11 SPARES AND ACCESSORIES

- A. See Section 13340 for spare parts requirements.
- B. All mounting hardware required for pipe stand, surface, or other mounting shall be provided.
- C. Each instrument shall be provided with a manufacturer installed stainless steel tag identifying the instrument tag number.

1.12 APPROVALS/CERTIFICATIONS

- A. Instruments for hazardous locations shall have Factory Mutual (FM), Canadian Standards Association (CSA), and CENELEC approvals and certifications as specified herein and as indicated on the Drawings or in the Instrument Device Schedule. The instrument specifications in Part 2 state the Class, Division, and gas groups for FM/CSA approval, followed in parenthesis by the CENELEC certification; however, instruments provided are only required to have the approval/certification stated above. The instrument shall have a stainless steel tag identifying the relevant approval or certification.

PART 2 PRODUCTS

2.01 GAUGE PRESSURE TRANSMITTERS

- A. Type:
 - 1. Microprocessor based, intelligent type.
- B. Function/Performance:
 - 1. Range: Range of the transmitter shall be the standard range of the manufacturer closest to the pressure range to be metered.
 - 2. Accuracy: 0.075 percent of span.
 - 3. Operating Temperature: -20 to 80 degrees C.
 - 4. Temperature Effect: Combined temperature effects shall be less than 0.2 percent of maximum span per 28 degrees C temperature change.
 - 5. Output: 4-20 mA DC linear with pressure or level, with HART protocol. Zero adjustable over the range of the instrument provided calibrated span is greater than the minimum calibrated span.
 - 6. Stability: 0.05 percent of upper range limit for 1 year.
 - 7. Display: Digital indicator displaying pressure or level in the engineering units indicated in the Instrument Device Schedule.
 - 8. Diagnostics:

- a. Self-diagnostics with transmitter failure driving output to above or below out of range limits.
 - b. Simulation capability for inputs and loop outputs.
 - c. Test terminals available to ease connection for test equipment without opening the loop.
 - d. Registers to record minimum and maximum pressure and temperatures transmitter has been exposed to shall be available.
 - e. Run-time clock available to determine usage for warranty purposes. 5-year warranty on this clock reading is included.
9. Over Range Protection: Provide positive over range protection to 150 percent of the maximum pressure of the system being monitored by the instrument.
10. If required to meet the range or suppression/elevation requirements, a differential pressure transmitter shall be provided.

C. Physical:

1. Enclosure: NEMA 4X (IP66), explosion proof, approved for Class I, Division 1, Groups C and D (EEx d IIC T5).
2. Process Wetted Parts: Isolating diaphragm and other wetted metal parts shall be Type 316L stainless steel, unless otherwise indicated in the device schedule. Gaskets and O rings shall be Teflon.
3. Power Supply: 24 VDC loop power.
4. Sensor Fill Fluid: Silicone.

D. Accessories Required:

1. Provide span and zero adjustment at each transmitter and through the handheld programming unit.
 - a. Configuration of the transmitter may be accomplished using the local display and pushbuttons without the use of an external programming device.
 - b. NOTE: Siemens, ABB and Foxboro have this capability
2. For each transmitter provide a Type 316 stainless steel block & bleed shut off valve. Valves may be mounted directly to the instrument or separately mounted. Valves shall be by the instrument manufacturer or by D/A Manufacturing or Anderson Greenwood.

E. Manufacturer(s):

1. Smar LD301M.
2. ABB 264HS.
3. Rosemount 3051CG.
4. Foxboro IGP20.

5. Siemens Sitrans P DS III
6. Or equal.

2.02 DIAPHRAGM SEAL - THREADED

A. Type:

1. Thread attached.
2. Welded Metal Diaphragm.

B. Function/Performance:

1. Maximum Pressure: Two times the maximum process pressure.
2. Operating Temperature: -40 to 100 degrees C.

C. Physical:

1. All Type 316L stainless steel construction.
2. Process connection: 1" NPT.
3. Teflon gaskets and O rings on process connection.
4. Bleeding connection provided. NOTE: filling screw not recommended since it provides poor quality measurement if done incorrectly in the field.

D. Accessories Required:

1. Stainless steel armored capillary tubing as required for the installation.

E. Manufacturer(s):

1. Rosemount.
2. Ashcroft.
3. Ronningen-Petter Company.
4. Siemens 7MF4861
5. Equal.

2.03 PRESSURE GAUGE

A. Type:

1. Bourdon tube actuated dial face pressure gauge.

B. Function/Performance:

1. Accuracy: Plus or minus 1.0 percent of span or better.

C. Physical:

1. Case: Phenolic shock resistant or Type 316 stainless steel for surface/stem mounting with a pressure relieving back. The case shall be vented for temperature/atmospheric compensation.
2. Window: Clear acrylic or shatter proof glass.
3. Bourdon tube: Stainless steel.
4. Connection: 1/2 in. NPT.
5. Gauge size: Minimum 4-in. viewable.
6. Pointer travel: Not less than 200 degrees not more than 270-degree arc.
7. Range: As indicated in the instrument device schedule. Range may include inches of water vacuum.

D. Accessories/Options Required:

1. Shutoff valve: Each gauge shall have a process shutoff valve that can also be used as an adjustable pressure snubber.
2. Special scales: Engineer reserves the right to require special scales and/or calibration if the manufacturer's standard is not suitable for the application.
3. Gauges shall be liquid filled at the factory.

E. Manufacturer(s):

1. Ashcroft.
2. Ametek US Gauge.
3. Weksler.
4. Or equal

PART 3 EXECUTION

3.01 GENERAL

- A. See execution requirements in Section 13300.

END OF SECTION

SECTION 15051

PIPING - GENERAL REQUIREMENTS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies the basic administrative and testing requirements for piping. Specific piping materials, systems and related installation and testing requirements are specified in other Sections of Division 15.

1.02 RELATED WORK

- A. Piping materials and systems are included in other Sections of Division 11 and 15.
- B. Valves are included in Section 15100.
- C. Piping specialties are include in Sectors 15120.
- D. Pipe supports are included in Section 15140.
- E. Pipe insulation is included in Section 15250.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, submittals for piping, piping specialties and piping systems as as required in the individual System or Piping Sections.

1.04 REFERENCE STANDARDS

- A. ASTM International
 - 1. ASTM A320 - Standard Specification for Stainless Steel Bolts and Studs
 - 2. ASTM A194- Standard Specification for Carbon and Alloy Steel Nuts
- B. American National Standards Institute (ANSI)
 - 1. ANSI B16.5 - Pipe Flanges and Flanged Fittings
 - 2. ANSI B31.3 - Process Piping
- C. American Welding Society (AWS)
 - 1. AWS B2.1 - Specification for Welding Procedure and Performance Qualifications
- D. American Water Works Association (AWWA)
 - 1. AWWA Manual M11 - Steel Pipe - A Guide for Design and Installation
- E. American Society of Mechanical Engineers (ASME)

- F. Underwriters Laboratories (UL)
- G. Factory Mutual (FM)
- H. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. All materials shall be new and unused.
- B. Install piping to meet requirements of local codes.
- C. Provide manufacturer's certification that materials meet or exceed minimum requirements as specified. Reference to standards such as ASTM and ANSI shall apply to those versions in effect at the time of bid opening.
- D. Coordinate dimensions and drilling of flanges with flanges for valves, pumps and other equipment to be installed in piping systems. Bolt holes in flanges shall straddle vertical centerline.
- E. Reject materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner and acid solder.
- F. Pipe-joint compound for pipe carrying flammable or toxic gas, must bear approval of UL or FM.
- G. Unless otherwise specified, pressures referred to in all Piping Sections are expressed in pounds per square inch in gauge above atmospheric pressure, psig and all temperature are expressed in degrees Fahrenheit (F).

1.06 DELIVERY, STORAGE AND HANDLING

- A. During loading, transportation and unloading take care to prevent damage to pipes and coating. Carefully load and unload each pipe under control at all times. Place skids or blocks under each pipe in the shop and securely wedge pipe during transportation to ensure no injury to pipe and lining.

PART 2: PRODUCTS

2.01 MATERIALS

- A. Specific piping materials and appurtenances are specified in the respective Piping or System Sections.
- B. General installation materials shall be as specified below.
 - 1. Unions shall be brass or bronze unions for joining nonferrous pipe; malleable brass or bronze-seated iron or steel unions for joining ferrous pipe; PVC unions for joining PVC pipe; CPVC unions for joining CPVC pipe; Stainless Steel unions for joining stainless steel pipe.

2. Flanged Joints. Pipe bolt sets shall consist of new bolts, nuts, washers and gaskets.
 - a. Bolts shall be ASTM A-320, type B8MA Class 1A, bright finish stainless steel with hexagon heads unless higher strength bolting is required for any special piping system specified later in the Contract Documents. Nuts shall be hex nuts conforming to ASTM A194, 8MA stainless steel. Bolts shall have American Screw Threads, Coarse Thread Series, ASME B1.1. Nuts shall be American Standard Heavy Dimension Series, ASME B18.2.2. Washers shall be Type 316 stainless steel.
 - b. Flanged joints shall be made with bolts or stud-bolts with a nut on each end. Bolts, stud-bolts and nuts shall be ANSI heavy dimension, hex heads and cold-punched hexagonal nuts. For bolts 1-3/4 inches in diameter and larger, stud-bolts shall be used. Bolt size shall be American Standard for ANSI Class 125 flanges.
 - c. Where flanged joints are in manholes or submerged in tanks, bolts, stud-bolts, and nuts shall be silicon bronze, ASTM B98, Alloy C65500 Code H04, of dimensions and sizes equal to steel bolts, stud-bolts, and nuts specified in Appendix A of AWWA C115.
 - d. Flange gaskets shall be in accordance with Appendix A of AWWA C115. They shall be full-face gaskets for flat faced flanges and flanged joints on 12-inch diameter and smaller pipe and shall be of the ring type for flanged joints on larger pipe. Gaskets shall be 1/8-in thick reinforced synthetic rubber gaskets unless otherwise specified in the piping section. Gasket material shall be compatible with the fluid service.
 - e. Anti-seize compound shall be applied to all stainless steel bolting: NeverSeez Pure Nickel Special Lubricant manufactured by Bostik, Inc., Wauwatosa, Wisconsin. Loctite Nickel Anti-Seize Lubricant Manufactured by Henkel Technologies, Rocky Hill, Connecticut. Chesterton 772 Premium Nickel Anti-Seize Compound manufactured by Chesterton Technical Products, Stoneham, Massachusetts.
3. Temporary Plugs shall be standard plugs or caps which are suitable for permanent service.
4. Wall Sleeve Seals shall be as specified in Section 01180.
5. Unless otherwise indicated by the pipe support design report required under Section 15140 or specifically called out on the Drawings, Flexible Connections shall be flanged spool type, 180 degree F maximum service, filled arch with synthetic rubber tube and cover, steel-ring reinforced synthetic fiber carcass, with flanges drilled to 150 lb ANSI B16.5. Steel retaining rings, control rods and compression sleeves shall be provided where shown and as required for the working pressure of the system in which the joint is installed. All flexible joints shall be rated for the working pressure of the system in which they are installed.

PART 3: EXECUTION

3.01 GENERAL

- A. All dirt, scale, weld splatter, water and other foreign matter shall be removed from the inside and outside of all pipe and sub-assemblies prior to installing.
- B. All pipe joints and connections to equipment shall be made in such a manner as to produce a minimum of strain at the joint.
- C. Install piping in a neat manner with lines straight and parallel or at right angles to walls or column lines and with risers plumb. Run piping so as to avoid passing through ductwork or

directly under electric light outlets and/or interference with other lines. All work shall be accomplished using recognized methods and procedures of pipe fabrication and in accordance with the latest revision of applicable ANSI Standards, ASME Codes and Pipe Fabrication Institute Standards.

1. Use full length of pipe except where cut lengths are necessary. Do not spring or deform piping to make up joints.
2. Pipe shall be cut square, not upset, undersize or out of round. Ends shall be carefully reamed and cleaned before being installed.
3. Bending of pipe is not permitted. Use fittings for all changes in direction.
4. Do not use bushings except where specifically shown on the Drawings or approved by the Engineer. Reducers shall be eccentric to provide for drainage from all liquid-bearing lines and facilitate air removal from water lines.
5. Verify the locations and elevations of any existing piping and manholes before proceeding with work on any system. Any discrepancies between the information shown on the Drawings and the actual conditions found in the field shall be reported at once to the Engineer. No claim for extra payment will be considered if the above provision has not been complied with.
6. Where lines of lower service rating tie into services or equipment of higher service rating the isolation valve between the two shall conform to the higher rating.
7. Mitering of pipe to form bends is not permitted, unless mitered pipe is specifically specified elsewhere.
8. All piping interiors shall be thoroughly cleaned after installation and kept clean by approved temporary closures on all openings until the system is put in service. Closures should be suitable to withstand the hydrostatic test.
9. End caps on pre-cleaned pipe shall not be removed until immediately before assembly. All open ends shall be capped immediately after completion of installation.

D. Test Connections

1. Provide 1/2-in female NPT test connection equipped with 1/2-in brass plug on all pump suction and discharge lines. Where indicated on the Drawings, test connections should be equipped with bar stock valve and gauge. Provide test connections at all steam traps. The connection shall be located on the discharge side of the trap between the trap and the first valve. It shall consist of a 1/2-in branch connection terminated with a gate valve.

E. Unions

1. Unions screwed or flanged shall be provided where indicated and in the following locations even if not indicated.
 - a. In long runs of piping to permit convenient disassembly for alterations or repairs.
 - b. In by-passes around equipment.

- c. In connections to tanks, pumps and other equipment between the shut-off valve and the equipment.
- d. In connections on both sides of traps, controls and automatic control valves.

F. Vents and Drains

1. Provide vents and drains in the following places:
 - a. Water Lines - Vents at high points and drains at low points.
 - b. Air Lines - Drains at low points.

3.02 UNIONS

- A. Use unions to allow dismantling of pipe, valves and equipment.

3.03 WELDING

- A. Welding in accordance with ANSI/ASME B31 and AWS B3.0.
- B. Install welding fittings on all welded lines. Make changes in direction and intersection of lines with welding fittings. Do not miter pipes to form elbows or notching of straight runs to form tees, or any similar construction. Do not employ welder who has not been fully qualified in the above specified procedure and so certified by approved welding bureau or similar locally recognized testing authority.

3.04 FLANGED JOINTS

- A. Make flanged joints with bolts; bolt studs with nut on each end; or studs with nuts where one flange is tapped. Use number and size of bolts conforming to same ANSI Standard as flanges. Before flange pieces are assembled, remove rust resistant coating from machined surfaces, clean gaskets and smooth all burrs and other defects. Make up flanged joints per ANSI/AWWA C115 Appendix A and AWWA Manual M-11. Pipe shall not be pulled into place to align flanges, no strain upon valves or other pieces of equipment shall be tolerated.
- B. Where stainless steel bolting is specified, thoroughly clean threads with stainless steel brush and apply approved anti-seize compound to stud threads immediately prior to installing nuts.
- C. Where metallic flange is coupled with non-metallic flange, both flanges shall be flat faced. Gaskets shall be full faced. Applied bolt tension shall not deform non-metallic flange in any direction.
- D. Where steel or ductile iron flanges are coupled with cast iron flanges both flanges shall be flat faced. Gaskets shall be full faced. Low strength bolting shall be used.
- E. Flange Joints shall meet requirements of ASME B31.1, Table 112.
- F. Installed flange joint tolerances shall be in conformance with ASME B16.5-2009, Section 7.

3.05 GROOVED JOINTS

- A. Installation of stainless steel grooved joint couplings specified above, pipe, and fittings shall be in accordance with the latest version of Manual I-100 "Field Installation Handbook" published by Victaulic Company, Easton, Pennsylvania.
- B. Coupling gaskets shall be installed with the Victaulic lubricant compatible with the elastomer used. Lubrication of the gasket exterior, gasket sealing lips, housings and pipe ends shall be done prior to joining to prevent gasket pinching.
- C. Coupling nuts shall be tightened evenly by alternating sides until metal-to-metal contact occurs at the bolt pads. For angle-bolt-pad couplings, even offsets must be present at the bolt pads to obtain pipe-joint rigidity

3.06 SLEEVE COUPLINGS

- A. Install tie rods, pipe clamps or bridles when sleeve type couplings or fittings are used in piping system where indicated, and at changes in direction or other places as necessary, to prevent joints from pulling apart under pressure. Use bridles and tierods at least 3/4-in in diameter, except where tierods replace flange bolts of smaller size, in which case fit with nut on each side of pair of flanges. Joint harnessing shall conform, as a minimum, to the requirements for the bolts and tie bolt lugs as set forth in AWWA Manual M11.

3.07 WALL SLEEVE SEALS

- A. Use expandable rubber segmented sealing device with corrosion-resistant fasteners to make watertight the annular space between pipe and sleeve. Determine the required inside diameter of each individual wall opening or sleeve to fit the pipe and seal it to assure a watertight joint as recommended by the manufacturer, before ordering, fabricating or installing. Install pipe concentrically through wall sleeve. Install and tighten seal per manufacturer's instructions.

3.08 TESTING

- A. Test all pipelines for water/gas tightness as specified in the Piping or System sections. Furnish all labor, testing plugs or caps, pressure pumps, pipe connections, gauges and all other equipment required. Testing shall be performed in accordance with one or more of the testing procedures appended to this Section as specified in each Piping or System Section. All testing shall be performed in the presence of the Engineer.
- B. Repair faulty joints or remove defective pipe and fittings and replace as approved by the Engineer. Retest.

3.09 HYDROSTATIC TEST

- A. SCOPE: This test shall be used to hydrostatically test piping systems for structural integrity and leaks. The test shall be performed at ambient temperature unless otherwise specified.

B. TEST FLUID

1. Water should be used as the test fluid whenever possible. In those systems where water cannot be used the test fluid may be either the one to be used in the system or the one agreed upon by the Engineer and the Contractor.

C. TEST EQUIPMENT

1. Water - Of sufficient capacity to deliver the required test pressure.
2. Strainer - On inlet side of the test pump to prevent foreign matter from entering the system.
3. Valves - Shall be provided on the suction and discharge side of the test pump.
4. Heater - To allow heating of the test fluid when elevated temperatures are required for test.
5. Relief Valve - Set at a pressure to relieve at 20 to 25 percent above the required test pressure.
6. Pressure Gauge(s) - Capable of reaching 50 percent over the test pressure. These should be located at the pump discharge and any other place deemed convenient by the Contractor.
7. Pressure gauges and relief valves shall be checked for accuracy before use in test procedures.

D. PREPARATION FOR TEST

1. Determine the fluid to be used for the test, and, if other than ambient temperature is required, what the test temperature will be.
2. When a fluid other than water is used for a test, the equipment used for the test shall be of a material compatible with the test fluid. Normally this would be equal to the piping material.
3. Vents shall be provided at the high points of the system and drains provided where means of venting or draining do not exist.
4. Remove or block off, all relief valves, rupture discs, alarms, control instruments, etc, that shall not be subjected to the test pressure.
5. All discs, balls, or pistons from check valves shall be removed if they interfere with filling of the system. Open all valves between inlet and outlet of the section to be tested.
6. Connect pump and provide temporary closures for all of the external openings in the system. Use caution to ensure that the closures are properly designed and strong enough to withstand the test pressure.
7. All joints, including welds, are to be left uninsulated and exposed for examination during test.
8. A joint previously tested in accordance with this Section may be covered or insulated.

9. Piping designed for vapor or gas shall be provided with additional temporary supports, if necessary, to support the weight of the test liquid.
10. Expansion joints shall be provided with temporary restraint for additional pressure under test or shall be isolated from the test.
11. Flanged joints, where blanks are inserted to isolate equipment during the test, need not be tested.

E. TEST PRESSURE

1. The hydrostatic test pressure shall be 1-1/2 times the design pressure unless otherwise specified in the System Section.

F. TEST PROCEDURE

1. Allow the test fluid to enter the system. Open vents to allow displacement of all entrapped air. For all pipelines exceeding 500-ft in length, the maximum rate of filling shall be limited to that which produces a maximum nominal flow velocity of one foot per second in the pipe to be tested.
2. Close vents and restrict personnel in the test area to those involved in the test.
3. Raise the pressure slowly with the pump until the predetermined test pressure is reached. Maintain pressure for duration of time specified in System Section, keeping personnel at a safe distance.
4. Reduce the pressure about 20 percent and hold it at that point while the entire system is carefully inspected for leaks, cracks, or other signs of defects.
5. If defects are found, the pressure shall be released, the system drained, the defects corrected and the test repeated.
6. After a satisfactory test has been completed, the line shall be drained.

G. FLUSHING

1. Lines tested with water shall be completely drained.
2. Lines shall be flushed, after test.

H. TEST RECORDS

1. Records shall be maintained of all tests performed.
2. Test records shall include:
 - a. Date of Testing
 - b. Identification of Piping Tested
 - c. Test Fluid
 - d. Test Pressure
 - e. Signatures of Contractor and Engineer

3. If leaks are found, they shall be noted, on the record. After correction, retesting as specified for original test.
4. Records of test shall be maintained by the Contractor and 3 copies furnished to the Engineer.

3.10 SERVICE PRESSURE TEST

- A. SCOPE: This test shall be used to test piping systems using service pressure and the fluid for which the system is used.
 1. It shall not be used to test piping systems conveying combustible or flammable liquids or systems that comply with ANSI B31 codes.
 2. Engineer shall decide if a service pressure test is allowable. Unless otherwise noted, Contractor shall provide hydrostatic test as specified above.
- B. TEST FLUID
 1. The fluid for which the system is designed shall be the test fluid.
- C. TEST EQUIPMENT
 1. A pressure gauge capable of registering 25 psi over the design pressure shall be installed down-stream from the supply shut-off valve if one is not included in the system.
- D. PREPARATION FOR TEST
 1. Insulated lines shall have all joints left exposed until completion of the test.
- E. TEST PRESSURE
 1. The test pressure shall be equal to the maximum pressure that the line will be subjected to under normal operating conditions as determined by the Engineer.
- F. TEST PROCEDURE
 1. Liquids
 - a. See that all personnel not involved in the test vacate the area.
 - b. Allow the system fluid to enter the system slowly while venting the air at the extreme far and uppermost points. For all pipelines exceeding 500-ft in length, the maximum rate of filling shall be limited to that which produces a maximum nominal flow velocity of one foot per second in the pipe to be tested.
 - c. When the system is full and all air is vented, close the vents.
 - d. Allow the pressure in the system to build up to the full line pressure.
 - e. Inspect entire system for leaks.
 2. Gas or Vapor (Including Compressed Air and Steam)
 - a. See that all personnel not involved in the test vacate the area.
 - b. In systems that do not have a pressure gauge near the main shut-off valve, a gauge shall be installed.

- c. Allow the system fluid to enter the system slowly until the full operating pressure is reached.
 - d. Shut off main supply valve. Observe the gauge for 15 minutes. The pressure gauge shall not drop during this time.
 - e. If the gauge drops, indicating the presence of leaks, the systems shall be inspected visually and, if necessary, with soap suds or commercially available leak detectors to locate the leak(s).
3. If leaks are found, the lines shall be relieved of pressure, purged if necessary, and repaired. Tests shall be repeated for repaired sections.

G. TEST RECORDS

1. Records shall be maintained of all tests performed.
2. Test records shall include:
 - a. Date of Testing
 - b. Identification of Piping Tested
 - c. Test Fluid
 - d. Test Pressure
 - e. Signatures of Contractor and Engineer
3. If leaks are found, they shall be noted on the record. After correction, retesting is required.
4. Test records shall be maintained by the Contractor and 3 copies furnished to the Engineer.

END OF SECTION

SECTION 15064

PLASTIC PIPE AND FITTINGS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install 1/8-in to 6-in non-buried plastic piping and appurtenances as shown on the Drawings and as specified herein.
- B. Refer to Section 15051 for additional general piping requirements.

1.02 RELATED WORK

- A. Cutting, coring and patching is included in Section 01045.
- B. Pipe identification is included in Section 01340.
- C. Pipe penetrations are included in Section 01172.
- D. Piping general requirements are included in Section 15051.
- E. Valves and appurtenances are included in Section 15100.
- F. Piping specialties are included in Section 15120.
- G. Pipe hangers and supports are included in Section 15140.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings and product data required to establish compliance with this Section. Submittals shall include the following:
 - 1. Shop drawings including piping layouts and schedules shall be submitted to the Engineer and shall include dimensioning, fittings, locations of valves and appurtenances, joint details, methods and locations of supports and all other pertinent technical specifications for all piping to be furnished.
 - 2. Shop drawing submittals for piping under this Section shall include all data and information required for the complete piping systems. All dimensions shall be based on the actual equipment to be furnished. Types and locations of pipe hangers and/or supports shall be shown on the piping layout for each piping submittal.

1.04 REFERENCE STANDARDS

- A. ASTM International.
 - 1. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

2. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
3. ASTM D2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.
4. ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
5. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
6. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
7. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
8. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
9. ASTM D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.
10. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
11. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
12. ASTM D3311 - Standard Specification for Drain, Waste and Vent (DWV) Plastic Fittings Patterns.
13. ASTM F437 - Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
14. ASTM F438 - Standard Specification for Socket - Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
15. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
16. ASTM F441 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
17. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
18. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
19. ASTM F594 - Standard Specification for Stainless Steel Nuts.

B. American National Standard Institute (ANSI)

1. ANSI B16.5 Pipe Flanges and Flanged Fittings.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. All plastic pipe and fittings of each type shall be furnished by a single manufacturer who is experienced in the manufacture of the items to be furnished; however, it shall not be a requirement that the pipe and fittings be manufactured by the same manufacturer, provided that the pipe and fittings are compatible in both compounding and size. The pipe and fittings shall be designed, constructed and installed in accordance with the best practices and methods and shall be suitable for the intended service.

1.06 SYSTEM DESCRIPTION

A. Piping shall be installed in those locations as shown on the Drawings.

B. The equipment and materials specified herein are intended to be standard types of plastic pipe and fittings for use in transporting wastewater, water, air and chemicals.

C. Plastic piping systems shall be designed for the following conditions:

- | | |
|-------------------|-----------------------------|
| 1. System: | WSL Sample Piping (WSL SL) |
| a. Material: | Schedule 80 PVC |
| b. Fluids: | Sludge and Water |
| c. Pressure: | Atmosphere to 40 psig |
| d. Flow Velocity: | Up to 10 fps |
| e. Temperature: | 50 to 85 degrees F |
| 2. System: | Secondary Scum Piping (SSC) |
| a. Material: | Schedule 80 PVC |
| b. Fluids: | Scum and water |
| c. Pressure: | Atmosphere to 40 psig |
| d. Flow Velocity: | Up to 10 fps |
| e. Temperature: | 50 to 85 degrees F |

PART 2: PRODUCTS

1.07 MATERIALS

A. Poly (Vinyl Chloride) Pipe and Fittings - PVC

1. Pipe shall be manufactured from PVC compounds meeting ASTM D1784, Class 12454-B in accordance with ASTM D1785, PVC 1120. The pipe shall have a minimum hydrostatic design stress of 2,000 psi at 73 degrees F and shall be suitable for field cutting and solvent welding. Pipe shall be of the sizes as shown on the Drawings and shall be Schedule 80 unless otherwise shown.

2. Fittings shall be the socket type for solvent welded joints conforming to ASTM D2467 or ASTM D2466 where Schedule 80 pipe is shown on the Drawings. Fittings shall be manufactured from PVC compound meeting ASTM D1784, Class 12454-B. Solvent cement shall be as specified in ASTM D2564.
- B. Flanged Joints for Sch 40 and Sch 80 PVC Piping.
1. Where flanged joints are required to fit up to valves and equipment or otherwise shown on the Drawings, they shall be supplied with 1/8-in thick fiber reinforced full faced gaskets.
 - a. Chemical service gaskets shall be Viton-n
 - b. General service gaskets shall be EPDM
 2. Flange bolt spacing, number and dimensions shall conform to the requirements of ANSI B16.5. CPVC and PVC flanges shall be flat faced solid socket solvent cement type and shall be suitable for a minimum pressure of 150 psi.
 3. Bolts, nuts and washers for flanged joints shall be for corrosive service conditions and shall be ASTM F593 and F594, Type 316 stainless steel, Condition A. Anti-seize compound for stainless steel bolts and nuts shall be of a molybdenum disulfide base such as Molycoat-G or equal.
- C. Grooved Joints
1. Grooved joints may be provided for the SSC piping. Pipe ends shall be furnished cut grooves using Victaulic Tool VG824 or equal.
 2. Couplings shall be style 77 painted steel using EPDM Flush Seal Gaskets.
 3. Bolt sets shall be ASTM F593 and F594, Type 316 stainless steel, Condition A.
- D. Fittings, specials, unions and flanges shall be of the same schedule number and manufactured of the same materials as the pipe. Whenever unions are called out on the Drawings, flanged connections may be substituted, provided that dimensional controls do not preclude use of flanges.
- E. Expansion joints for PVC and CPVC sizes 1/2-in to 6-in shall be telescoping type as manufactured by Plastinetics, Inc.; ASAH/America or equal. Expansion in pipes smaller than 1/2-in shall be accommodated with expansion loops.

PART 2 EXECUTION

2.01 INSTALLATION

- A. The installation of plastic pipe shall be strictly in accordance with the manufacturer's technical data and printed instructions.
- B. Joints for PVC and CPVC pressure pipe shall be solvent cemented unless flanged or threaded are otherwise shown on the Drawings or are specified as other types herein. In making solvent cemented connections, clean dirt and moisture from pipe and fittings, bevel pipe ends slightly with emery cloth to remove any shoulder or burrs created by cutting of the pipe. Solvent cement joints shall be made in accordance with ASTM D2855 except that solvent cement formulated

especially for and as specified above shall be used for joining CPVC pipe and fittings. Primer shall be used whenever recommended by the pipe, fitting, or cement manufacturer and in all cases for joints on pipe systems 4-in in diameter or larger. Making solvent cement joints shall not be performed and the work shall stop when the temperature, measured in the shade, is 40 degrees F and falling.

- C. Joints between PVC drain, waste and vent pipe and cast-iron soil pipe shall be made with approved mechanical compression joints designed for such use.
- D. Grooved joints shall be made in compliance with the coupling manufacturers written instruction. Grooves shall be prepared in the suppliers facility and shall be within required tolerance to .001 inches.
- E. Installation of valves and fittings shall be in accordance with manufacturer's instructions. Particular care shall be taken not to overstress threaded connections. In making solvent cement connections, the solvent cement or primer shall not be spilled on valves. Any cement allowed to run from joints shall be cleaned from the pipe and fittings immediately.
- F. All piping shall have a sufficient number of unions to allow convenient removal of piping and shall be as approved by the Engineer. PVC and CPVC pipe shall be installed with at least one expansion joint or loop near the center of each straight run of pipe which is 50-ft or longer with the maximum spacing between expansion joints or loops being 150-ft.
- G. Where plastic pipe passes through wall sleeves, the space between the pipe and sleeve shall be sealed with a mechanical sealing element as specified in Section 01172.
- H. All plastic pipe to metal pipe connections shall be made using flanged connections. Metal piping shall not be threaded into plastic fittings, valves, or couplings nor shall plastic piping be threaded into metal valves, fittings or couplings. Only socket to thread adaptors shall be used for threaded plastic pipe connections to other threaded devices.
- I. Concrete inserts for hangers and supports shall be furnished and installed in the concrete as it is placed. The inserts shall be set in accordance with the requirements of the piping layout and the Contractor shall verify these locations from approved piping layout drawings and the structural drawings. Pipe hangers and supports are specified in Section 15140.

2.02 FIELD TESTING

- A. All pipelines shall remain undisturbed for the minimum curing or cooling time specified for each type of pipe material but no less than 16 hours to develop full curing and complete strength at all joints. All pipe systems shall be flushed clean and then subjected to a hydrostatic pressure test for 12 hours at a test pressure and temperature specified below. Testing procedures shall be as specified below. Should the temperature not be attainable under hydrostatic conditions, then the test may be performed under hydro-dynamic conditions, provided that accurate measurements for loss of the test fluid can be made, or the pressure shall be proportionally increased to simulate the stresses of the higher temperature in relation to the lowest system temperature that is expected during the duration of the test. The proportionally higher test pressures shall be determined in accordance with the accepted temperature versus strength properties as published by the pipe manufacturer, PPI or other pipe material standards organization. Allowance for expansion of polyethylene pipe during the test shall be made in accordance with PPI Technical Report TR31.

- B. The test pressures and temperatures for the various pipe lines shall be as follows:
1. WSL SL piping: 80 psi at 73 degrees F.
 2. SSC piping 80 psi at 73 degrees F.
 3. Drain piping: 15 psi at ambient temperature
 4. Vent piping: 15 psi at ambient temperature
- C. The test shall be performed by slowly filling the piping system, expelling entrapped air from all high points. The fill rate shall be controlled so that the fluid velocity within the pipe system is less than 2 fps. Upon completion of the filling process, the system shall be brought up to the specified test temperature as applicable, holding the system pressure to less than 10 percent of the test pressure. Once the system has been stabilized at the specified test temperature, the pipe should be slowly brought up to the test pressure in such a manner so as to not create shock, surge or water hammer in the pipe system. The test duration time limit shall not begin until the full pressure specified above has been reached and the system has been stabilized to within 5 percent of the test temperature. The system pressure and temperature shall be maintained to within 1/2 percent but no more than 5 percent of the specified value for the temperature and within 5 psi of the specified value for the pressure. These tolerances shall be held for the entire duration of the test. Upon completion of the test, the pressure shall be slowly removed by opening a valve or other pressure relieving device at a location remote to the location of the pressure/temperature monitoring equipment.
- D. The pressure test shall be monitored by a recording type pressure gauge for tests not requiring temperature control or a dual pen pressure/temperature recording gauge when temperature control is required. The entire test process shall be recorded, including the initial temperature stabilization and pressurization of the piping system. The record shall be continuous through the system test and shall show the final de-pressurization of the pipe system.
- E. All visible leaks detected during the pressure test shall be repaired and the pressure/ temperature test rerun. A successful test shall be a test in which no visible leaks are detected and the pipe system pressure can be maintained within 1/2 percent but no more than 5 psi of the specified value.
- F. Prior to testing, the pipelines shall be supported in an approved manner to prevent movement during the tests.

END OF SECTION

SECTION 15072

DUCTILE IRON PIPE AND FITTINGS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required, install, and test ductile iron pipe and fittings for plant mechanical piping as shown on the Drawings and as specified herein.
- B. Mechanical piping shall include all piping and fittings installed above grade, in utility tunnel or gallery and shall exclude pipe in valve vaults, manholes, cleanouts and similar yard structures.
- C. Mechanical piping shall be installed as shown on the Drawings. Provide pipe supports, hangers and couplings as required to achieve a complete pipe system.
- D. Where the word "pipe" is used, it shall refer to pipe, fittings, or appurtenances unless otherwise noted.

1.02 RELATED WORK

- A. Delivery, Storage and Handling is included in Section 01600.
- B. Painting is included in Section 09901 and Section 09902.
- C. General Piping Requirements are included in Section 15051.
- D. Valves and Appurtenances are included in Section 15100.
- E. Piping Specialties are included in Section 15120.
- F. Pipe Hangers and Supports are included in Section 15140.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings and product data required to establish compliance with the Section. Submittals shall include the following
 - 1. Tabulated layout drawings showing actual pipe lengths, diameters, fittings and appurtenances.
 - 2. Prior to shipment of pipe, submit a certified affidavit of compliance from the pipe manufacturer stating that the pipe, fittings, gaskets, linings and exterior coatings for this project have been manufactured and tested in accordance AWWA and ASTM standards and requirements specified herein.

1.04 REFERENCE STANDARDS

- A. ASTM International

1. ASTM C150 - Standard Specification for Portland Cement.
- B. American National Standards Institute (ANSI)
1. ANSI B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form).
 2. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Classes 25, 125 and 250.
 3. ANSI B18.2 - Square and Hex Bolts and Screws Inch Series Including Hex Cap Screws and Lag Screws.
- C. American Water Works Association (AWWA)
1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
 2. AWWA C110 - Ductile-Iron and Gray-Iron Fittings. (3-in Through 48-in)
 3. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 4. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 5. AWWA C116 – Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.
 6. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
 7. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
 8. AWWA C153 – Ductile-Iron Compact Fittings for Water Service.
 9. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
 10. AWWA C606 - Grooved and Shouldered Joints.
 11. AWWA C651 - Disinfecting Water Mains.
- D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. Each length of ductile iron pipe supplied for the project shall be hydrostatically tested at the point of manufacture to 500 psi for a duration of 10 seconds per AWWA C151. Testing may be performed prior to machining bell and spigot. Failure of ductile iron pipe shall be defined as any rupture of the pipe wall. Certified test results shall be furnished in duplicate to the Engineer prior to time of shipment.
- B. All ductile-iron pipe and fittings to be installed under this project shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured.

Furnish in duplicate to the Engineer sworn certificates of such tests and their results prior to the shipment of the pipe.

- C. All pipe and fittings to be installed under this Contract may be inspected at the plant for compliance with this Section by an independent testing laboratory selected by the Owner, at the Owner's expense.
- D. Inspection of the pipe and fittings will also be made by the Engineer or representative of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the specified requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job.
- E. All pipe and fittings shall be permanently marked with the following information:
 - 1. Manufacturer, date.
 - 2. Size, type, class, or wall thickness.
 - 3. Standard produced to (AWWA, ASTM, etc).

1.06 SYSTEM DESCRIPTION

- A. Piping shall be installed in those locations as shown on the Drawings.
- B. Ductile iron piping systems are as follows:
 - 1. System: Waste Activated Sludge (WSL)
 - a. Max Operating Pressure: 60 psi
 - b. Test Pressure: 90 psi
 - c. Flow Velocity: 2-8 fps
 - d. Temperature: ambient to 90 deg. F

1.07 DELIVERY, STORAGE AND HANDLING

- A. See Section 01600 for general requirements.
- B. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe or coatings. Under no circumstances shall the pipe be dropped or skidded against each other. Slings, hooks, or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior surface or internal lining of the pipe.
- C. Materials, if stored, shall be kept safe from damage. The interior of all piping, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times.
- D. Pipe ends including flange faces shall be protected from damage. All openings shall be adequately covered with a minimum ½" thick wooden blind flange secured in place with steel fasteners or end-caps/plugs be put on pipes to prevent entrance of dirt, water and debris, and keep the pipe interior clean.

- E. Pipe shall not be stacked higher than the limits recommended by its manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete. Stacking shall conform to manufacturer's recommendations.

PART 2: PRODUCTS

2.01 MATERIALS

A. Pipe

- 1. Ductile iron pipe shall conform to AWWA C115 and C110. Flanged end pipe shall be Thickness Class 53 per AWWA C150.
- 2. Ductile iron pipe for use with split-type coupling joints shall have radius grooved ends conforming to AWWA C606. Pipe shall have grooved ends to provide either a rigid joint or flexible joint as shown on the Drawings and as specified herein. Flexible joint grooving shall permit expansion and contraction, and angular deflection. Rigid joint grooving shall allow no angular or linear movement. Minimum pipe wall thickness for grooved pipe shall be the following class:

<u>Size</u>	<u>Class</u>
4 thru 16	53
18	54
20	55

- 3. Pipe shall be supplied in standard lengths as much as possible.
- 4. Ductile iron pipe shall be as manufactured by U.S. Pipe and Foundry Company, Inc.; American Cast Iron Pipe Company; Clow Water System Company, or equal.

B. Joints

- 1. Ductile iron pipe shall have flanged or grooved joints as indicated on the Drawings.
- 2. Flanges shall be flat face type, except raised face flanges shall be used where mating to raised face flanges of other equipment or piping systems. Flat faced flanges shall meet ANSI B16.1 Class 125. Flange faces shall be spiral or concentrically serrated.
 - a. Pipe bolt sets shall consist of new bolts, nuts, washers and gaskets. Bolt size shall be American Standard for ANSI Class 125 flanges. Bolts shall be ASTM A320, type B8MA Class 1A, bright finish stainless steel with heavy hexagon heads. Nuts shall be heavy hex nuts conforming to ASTM A194, 8MA stainless steel. Bolts shall have rolled American Screw Threads, Coarse Thread Series, ASME B1.1. Nuts shall be American Standard Heavy Dimension Series, ASME B18.2.2. Washers shall be Type 316 stainless steel.
 - b. Flanged joints shall be made with bolts or stud-bolts with a nut on each end. For bolts 1-3/4 inches in diameter and larger, stud-bolts shall be used. Fully tensioned bolt length shall result in full thread engagement with nut, and not exceeding 5/8-in. reveal.
 - c. Where flanged joints are in vaults, sumps, manholes or submerged; bolts, stud-bolts, and nuts shall be silicon bronze, ASTM B98, Alloy C65500 Code H04, of dimensions and sizes equal to steel bolts, stud-bolts, and nuts specified in Appendix A of AWWA C115.

- d. Flange gaskets shall be in accordance with Appendix A of AWWA C115. They shall be full-face gaskets for flat faced flanges and flanged joints on 12-inch diameter and smaller pipe and shall be of the ring type for flanged joints on larger pipe. Gaskets shall be 1/8-in thick reinforced synthetic rubber gaskets unless otherwise specified below.
 - 1) Sludge and water up to 150 psi service, flat face flanges up to 12 inch diameter; Full face SBR red rubber 80 Shore D hardness, ASTM 1330 Grade II.
 - 2) Sludge and water over 150 psi service, raised face or flat face flanges above 12 inch diameter; Ring type aramid fiber reinforced nitrile.
 - 3) Potable water service gaskets shall be NSF60 approved.
 3. Anti-seize compound shall be applied to all stainless steel bolting: NeverSeez Pure Nickel Special Lubricant manufactured by Bostik, Inc., Wauwatosa, Wisconsin. Loctite Nickel Anti-Seize Lubricant Manufactured by Henkel Technologies, Rocky Hill, Connecticut. Chesterton 772 Premium Nickel Anti-Seize Compound manufactured by Chesterton Technical Products, Stoneham, Massachusetts.
 4. Grooved joints shall conform to AWWA C606 standard rigid couplings and shall be Style 31 couplings as manufactured by Victaulic, or equivalent products of Anvil International or approved equal.
 5. Sleeve type couplings shall be Dresser Style 38 or 138 as manufactured by Dresser Industries, or equivalent products of Smith-Blair, Romac Industries, Ford Meter Box Co or approved equal.
 6. Flanged coupling adaptors shall be Dresser Style 128, Smith-Blair Type 912 or 913, or equivalent products of Robar Industries LTD or approved equal.
- C. Fittings
1. Pipe fittings shall be ductile iron, supplied with ANSI Class 125 flanges with a pressure rating of 250 psi. Fittings shall be compact type in accordance with AWWA C153. Fittings shall also meet the requirements of AWWA C110 as applicable. Fittings shall have the same pressure rating, as a minimum, of the connecting pipe.
- D. Interior Lining
1. Ductile iron pipe and fittings shall have a cement mortar lining and asphaltic seal coat in accordance with AWWA C104. The cement shall be Type II per ASTM C150.
 2. All interior linings for potable water use shall be certified by NSF 61.
- E. Exterior Coatings
1. Unless otherwise specified, all coatings shall be shop applied with "hold-backs" provided as required at pipe and fitting ends for satisfactory installation for joint connections in the field. Provide all necessary coating materials to perform field coating applications at joints. Unless otherwise noted, field applied coating material shall be compatible with or equal to the shop applied material. Field repair of pipe with damaged coating shall receive prior approval of the Engineer. If, in the opinion of the Engineer that the coating damage is

beyond repair the pipe shall be replaced at the expense of the Contractor. All flange bearing surfaces shall be uncoated.

2. Unless otherwise specified, all exposed exterior ferrous surfaces shall be painted with an applicable paint system as specified under Division 9. Surface preparation and application thereof shall be in conformance with applicable provisions of Division 9.

F. Pipe Hangers and Supports

1. Pipe hangers and supports shall be provided at suitable distance along the pipeline regardless whether they are shown or not shown on the Drawings.
2. Pipe hangers and supports shall be as specified in Section 15140.

PART 3: EXECUTION

3.01 PIPE INSTALLATION

A. General

1. All piping and fittings shall be installed true to alignment and rigidly supported. Anchorage shall be provided where required. Any damage to linings shall be repaired to the satisfaction of the Engineer before the pipe is installed. Each length of pipe shall be cleaned out before installation. All of manufacturer's recommendations shall be complied with.
2. The deflection at joints shall not exceed that recommended by the pipe manufacturer. Fittings, in addition to those shown on the Drawings, shall be provided, if required, in areas where conflict exists with the existing facilities.
3. When pipe cutting is acceptable to the Engineer, the cutting shall be done by abrasive saw, leaving a smooth cut at right angles to the axis of the pipe. Any damage to the lining shall be repaired to the satisfaction of the Engineer. Field cut ends shall be sealed with approved epoxy coating in accordance with manufacturer's instructions.
4. Ductile iron and fittings shall be installed in accordance with requirements of AWWA C600 modified.

B. Jointing

1. Flanged joints shall be made using gaskets, bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped. The number and size of bolts shall conform to the same ANSI Standard as the flanges.
2. Bolts in flanged joints or mechanical joints shall be tightened alternately and evenly.
3. Sleeve type couplings and grooved joints using split ring couplings shall be installed in accordance with the procedures recommended by their respective manufacturers.

- C. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated

requirements that piping loads shall not be transmitted to their equipment, submit a certification stating that such requirements have been complied with.

- D. Sleeves of proper size shall be installed for all pipes passing through floors or walls. Sleeves shall be installed as shown on the Drawings. Where indicated on the Drawings or required for liquid or gas-tightness, the pipe shall be sealed with a mechanical seal similar to Link-Seal as manufactured by Thunderline Corporation, or equal.
- E. Sleeves and wall pipes shall have thrust collar located at the mid-depth of wall.
- F. Concrete inserts for hangers and supports shall be furnished and installed as recommended by the manufacturer as shown on the Drawings or as specified herein. The inserts shall be set in accordance with the requirements of the piping layout and their locations verified from approved piping layout drawings and the structural drawings.
- G. Pipelines supported by pipe hangers from the ceiling, or otherwise supported where lateral displacement of pipe is probable, shall be seismically braced laterally and braced longitudinally and laterally at 90 degree bends. The seismic bracing, shall be as determined by the pipe support design requirements of Section 15140.

3.02 TESTING

- A. All piping shall be subject to acceptance tests. Provide all necessary utilities, labor and equipment for flushing and testing and dispose all waste after the test including water.
- B. All pipe and fittings shall be pressure tested using water to 1.5 times the working pressure for 1 hour and the pipeline shall show no leakage.
- C. Correct any leakage and repair any damage to the pipe and pipe appurtenances or to any structures resulting from, or caused by tests. All leaks shall be repaired and lines retested.

3.03 CLEANING

- A. Clean the pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered during the construction period. All debris shall be removed from the pipeline. The lowest segment outlet shall be flushed last to assure debris removal.

3.04 PIPE MARKING

- A. All exposed piping, exterior and interior, shall be identified as specified in section 01340.

END OF SECTION

SECTION 15075

CHEMICAL HOSE AND APPURTENANCES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install, in the locations as shown on the Drawings, the chemical hose and appurtenances as specified herein.

1.02 RELATED WORK

- A. Wastewater sampling system is included in Section 11392.
- B. Plastic pipe and fittings are included in Section 15064.
- C. Pipe hangers and supports are included in Section 15140.
- D. Valves and appurtenances are included in Section 15100.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings, including dimensioning and technical specifications for all chemical hose to be furnished. Submittals shall include layouts complete with locational dimensions and elevations.
- B. Complete description of chemical resistance of chemical hose and all appurtenances that will come in contact with chemicals as specified herein.
- C. Letter of Certification that tubing is compatible with chemical service intended.

1.04 [REFERENCE STANDARDS]

1.05 QUALITY ASSURANCE

- A. All chemical hose shall be furnished by manufacturers, who are fully experienced, reputable and qualified in the manufacturer of the chemical hose to be furnished. The materials shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with this Section.
- B. The hose manufacturer shall guarantee that the hose supplied is adequate and suitable for the intended service.

PART 2: PRODUCTS

2.01 GENERAL

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials/equipment shall be the end products of one manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts and manufacturer's service.

2.02 MATERIAL

- A. Provide type of hose lines as shown on the Drawings and as specified herein. Hose sizes refer to hose inside diameter.

<u>Service</u>	<u>Type of Hose</u>	<u>Size, in.</u>
1. WSL Sample Lines	Tygon "Inner-Braided"	2

Length of hose shall be adequate for device intended.

2.03 EQUIPMENT

- A. Sample Hose
 - 1. Hose for WSL sample lines shall be Tygon "Inner-Braided Tubing" with dacron braid embedded in a diamond pattern within the walls of the hose. Sizes and lengths as specified above.
 - 2. Quick disconnect couplings and adaptors shall be located as shown on the Drawings and designed for a working pressure of 150 psi. Couplings shall be of stainless steel and utilize a cam type mechanism to connect the coupling and the adaptor pieces to form a leak proof connection. The disengagement handle pins and handle rings shall be stainless steel.

PART 3: EXECUTION

3.01 INSTALLATION

- A. The installation of chemical hose and appurtenances shall be strictly in accordance with the manufacturer's technical data and printed instructions.

3.02 FIELD TESTING

- A. All chemical hose lines shall be subjected to a hydrostatic pressure test for 1 hours at 20 psi test pressure. All leaks shall be repaired and lines retested as approved by the Engineer.

END OF SECTION

SECTION 15100

VALVES

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install complete and ready for operation and test all non-buried valves as shown on the Drawings and as specified herein.
- B. Provide services to upgrade existing electric actuators, mount on new valves and set operating stops, as indicated on the Drawings and specified herein.
- C. The equipment shall include, but not be limited to, the following. However not all items specified herein may be included in this project.
 - 1. General Requirements
 - 2. Valve Actuators – Manual
 - 3. Valve Actuators – Powered
 - 4. Gate Valves
 - 5. Plug Valves
 - 6. Check Valves
 - 7. Ball Valves
 - 8. Thermoplastic Valves
 - 9. Needle Valves
 - 10. Pressure Regulating Valves
 - 11. Solenoid Valves
 - 12. Corporation Stops
 - 13. Air Release and Vacuum Relief Valves

1.02 RELATED WORK

- A. Valve tags are included in Section Section 01340.
- B. Buried valves and appurtenances are included in Division 2.
- C. Piping and disinfection for potable water systems is included in the respective Sections of Divisions 2 and 5.

- D. Shop and Finish painting is included in Sections 09901 and 09902.
- E. Instrumentation, not specified herein, is included in Division 13.
- F. Valves on all HVAC and plumbing systems are included in their respective sections of Division 15.
- G. Piping Specialties are included in Section 15120.
- H. Electrical work is included in Division 16.
- I. Certain items similar to those specified in this Section may be specified to be furnished and installed with individual equipment or systems. In case of a conflict, those individual equipment or system requirements shall govern.
- J. Electric valve operators of all types, rate of flow controllers (including modulating valves and operators) and other types of valves which are part of the automated instrumentation (such as some solenoid valves) if not included herein are included in Division 13. Valve operators shall, however, be mounted at the factory on the valves as specified herein, as part of the work of this Section.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, materials required to establish compliance with this Section. The first submittal shall be the valve schedule described in Paragraph 1.09. Approval of the valve schedule submittal is required prior to Contractor submitting any of the equipment in this specification. Subsequent Equipment Submittals shall include at least the following:
 - 1. Valve tag number.
 - 2. The manufacturer and supplier.
 - 3. The address at which equipment will be fabricated or assembled.
 - 4. Drawings showing assembly details, materials of construction and dimensions.
 - 5. Descriptive literature, bulletins and/or catalogs of the equipment.
 - 6. The total weight of each item.
 - 7. A complete bill of materials.
 - 8. Additional submittal data, where noted with individual pieces of equipment.
 - 9. Individual electrical/pneumatic/hydraulic control schematics and wiring diagrams for each valve operator with all external interfaces, identified exactly as detailed on the Electrical and Instrumentation Drawings. Standard catalogue cut sheets that show typical wiring diagrams only are not acceptable. Valve actuators shall be coordinated with electrical requirements shown on the Drawings and valves as specified herein.

B. Test Reports

1. Provide certified hydrostatic test data, per manufacturer's standard procedure or MSS-SP-61 for all valves.

C. Certificates

1. For each valve specified to be manufactured, tested and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with the appropriate standards, including certified results of required tests and certification of proper installation.

D. Manufacturer's Installation and Application Data

E. Operating and Maintenance Data

1. Operating and maintenance instructions shall be furnished to the Engineer as provided in Section 01730. The instructions shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions and other information required to instruct operating and maintenance personnel unfamiliar with such equipment.

1.04 REFERENCE STANDARDS

A. ASTM International

1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
3. ASTM A240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels.
4. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.
5. ASTM A436 - Standard Specification for Austenitic Gray Iron Castings.
6. ASTM A536 - Standard Specification for Ductile Iron Castings.
7. ASTM B30 - Standard Specification for Copper-Base Alloys in Ingot Form.
8. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings

B. American Water Works Association (AWWA)

1. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
2. AWWA C500 - Metal-Seated Gate Valves Supply Service
3. AWWA C507 - Ball Valves, 6-in through 48-in (150mm through 1200mm)

4. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-in (50mm through 24-in (600mm) NPS
 5. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service
 6. AWWA C511 - Reduced-Pressure Principle Backflow-Prevention Assembly
 7. AWWA C540 - Power-Actuating Devices for Valves and Sluice Gates
 8. AWWA C541 – Hydraulic and Pneumatic Cylinder and Vane Type Actuators for Valves and Slide Gates
 9. AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants
 10. AWWA C800 - Underground Service Line Valves and Fittings
- C. American National Standards Institute (ANSI)
1. ANSI B1.20.1 - Specifications, Dimensions, Gauging for Taper and Straight Pipe Threads (except dry seals).
 2. ANSI B16.1/16.42/16.5 - Cast Iron/Ductile Iron/Steel and Stainless Steel Pipe Flanges and Flanged Fittings
 3. ANSI B16.10 - Face-to-Face and End-to-End Dimensions of Valves
- D. American Iron and Steel Institute (AISI)
- E. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)
1. MSS-SP-61 - Pressure Testing of Steel Valves.
 2. MSS-SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends.
 3. MSS-SP-71 - Cast Iron Swing Check Valves, Flanges and Threaded Ends.
 4. MSS-SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Services.
 5. MSS-SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
 6. MSS-SP-80 - Bronze Gate, Globe, Angle and Check Valves.
 7. MSS-SP-82 - Valve Pressure Testing Methods
 8. MSS-SP-98 - Protective Coatings for the Interior of Valves, Hydrants and Fittings.
- F. National Electrical Manufacturers Association (NEMA)
- G. Underwriters Laboratories (UL)
- H. Factory Mutual (FM)

- I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Valves and actuation systems shall be products of well established firms who are fully experienced, minimum 10 years, reputable and qualified in the manufacture of the particular equipment to be furnished.
2. The valves shall be mated to actuators at manufacturers or integrators facility. Actuated valves shall be fully tested and certified ready for installation prior to shipment to the job site. In no case shall actuators be mounted to the valves in the field.
3. All valves of the same type shall be the product of one manufacturer.
4. Valve actuators in each below category shall be the product of one manufacturer, Contractor shall coordinate this requirement with actuated valves included in the scope of vender furnished equipment specified in Division 11, 13, 14 and 15.
 - a. 120 volt, single phase for valves 3 inch and below
 - b. 480 volt, three phase
 - c. Pneumatic
 - d. Hydraulic

B. Certifications

1. The manufacturers shall furnish an affidavit of compliance with Standards referred to herein as specified in Paragraph 1.03C above. Refer to PART 3 for testing required for certain items in addition to that required by referenced standards.

C. Provide the services of a qualified and factory-trained service representative of the manufacturer to provide operational and maintenance instruction, for a 1 day, 8 hour period for each type of the following equipment:

1. 480 volt electric actuators.
2. Pneumatic actuators
3. Hydraulic cylinder actuators
4. Pressure regulating valves.
5. Surge relief valves.
6. Pinch valves.

D. Inspection of the units may also be made by the Engineer or other representative of the Owner after delivery. The equipment shall be subject to rejection at any time due to failure to meet any of the specified requirements, even though submittal data may have been accepted previously.

Equipment rejected after delivery shall be marked for identification and shall be removed from the job site at once.

1.06 SYSTEM DESCRIPTION

- A. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of water, wastewater, sludge, air, and chemicals as noted on the Drawings.
- B. Valves, appurtenances and miscellaneous items shall be installed as shown on the Drawings and as specified, so as to form complete workable systems.
- C. Unless otherwise noted all electrically powered valve operators shall have:
 - 1. Valves larger than 3-in: electric operators 460 Volt, 3 Phase, 60 Hz.
 - 2. Valves 3-inch and under: electric operators, 120 Volt, 1 Phase, 60Hz.
 - 3. Solenoid valves: 120 volt, single phase, 60 Hz, NEMA 4 enclosure, continuous duty Class F coils and manual operator. Solenoid valves for seal water systems shall be "fail open" design; others shall be "fail closed" unless otherwise noted on the Drawings or in the Instrumentation specifications.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Reference is made to Section 01600 for additional information.
- B. Packing and Shipping
 - 1. Care shall be taken in loading, transporting and unloading to prevent injury to the valves, appurtenances, or coatings. Equipment shall not be dropped. All valves and appurtenances shall be examined before installation and no piece shall be installed which is found to be defective. Any damage to the coatings shall be repaired as acceptable to the Engineer.
 - 2. Prior to shipping, the ends of all valves shall be acceptably covered to prevent entry of foreign material. Covers shall remain in place until after installation and connecting piping is completed.
 - a. All valves 3-in and larger shall be shipped and stored on site until time of use with wood or plywood covers on each valve end.
 - b. Valves smaller than 3-in shall be shipped and stored as above except that heavy cardboard covers may be used on the openings.
 - c. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until the valve is installed and put into use.
 - d. Any corrosion in evidence at the time of acceptance by the Owner shall be removed, or the valve shall be removed and replaced.
 - e. Actuated valve assemblies shall be blocked and secured to prevent any strain on the mounting arrangement during transit and storage. All electrical/pneumatic/hydraulic components shall be protected from weather and moisture in any form.
- C. Storage and Protection

1. Special care shall be taken to prevent plastic and similar brittle items from being directly exposed to the sun, or exposed to extremes in temperature, to prevent deformation. See the individual piping sections and manufacturer's information for further requirements.

1.08 MAINTENANCE

- A. Special tools and the manufacturer's standard spare parts, if required for normal operation and maintenance, shall be supplied with the equipment in accordance with Section 01730 and where noted, as specified herein. Tools shall be packaged in a steel case, clearly and indelibly marked on the exterior to indicate equipment for which tools are intended.
- B. Provide one Operations and Maintenance manual for each type of valve and operator supplied under this specification in accordance with Section 01730.
- C. Included within the Operations and Maintenance manuals, provide a list of all spare and replacement parts with individual prices and location where they are available.

1.09 VALVE DESIGNATIONS AND SCHEDULE

- A. Valve locations and basic types are shown on the Drawings. The specific valve type and trim required is identified by the valve call outs. The valve call outs include an alpha-numeric Tag that indicates the required valve type/trim for that location. The products specified in Section 2 below each have a Tag identifier. Powered actuator type is identified by symbology on the P&IDs. If a valve Tag is not included on the Drawing call outs, Contractor shall submit an RFI requesting valve identification.
- B. The Contractor shall refer to the P&IDs and Mechanical Drawings and prepare a Valve Schedule for each process valve in the Project. Contractor's first submittal under this Section shall be the Valve Schedule, which shall include a unique valve Number as labeled on the P&IDs. Submit with the Valve List a copy of the Contract Drawing P&IDs indicating each unique valve Number next to the valve symbol. This valve schedule shall NOT include the valves furnished in Plumbing and HVAC sections of Division 15.
- C. The valve schedule shall include: valve Number; valve Tag; valve size; end connections, operator type and reference Drawing number(s). The valve tag convention shall be as required by the Owners convention, coordinated during the Valve Schedule submittal process. Where electric, hydraulic or pneumatic actuators are supplied their type shall be so noted with an E, H or P. Modulating duty actuators shall be noted with an M following the actuator type notation.
- D. The Contractor shall include the Valve Number and Tag with each valve shop drawing submittal.
- E. An excerpt of an EXAMPLE schedule is as follows:

<u>Number</u>	<u>Tag</u>	<u>Size</u>	<u>Ends</u>	<u>Operator</u>	<u>Drawing Number</u>
1000	BV1	2-in	Flanged	Lever	I-4, M-12
1002	PV2	8-in	Lugged	Gear/Handwheel	I-5, M-15
1005PV1	6-in	Flanged	EM	I-7, M-16	

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT - GENERAL

- A. Reference is made to Division 1 for additional requirements, including nameplates, provisions for temporary pressure gauges, protection against electrolysis and anchor bolts.
- B. The use of a manufacturer's name and/or model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- C. Valves shall be of the size shown on the Drawings or as noted.
- D. All products shall be new and unused. All valves of the same type shall be identical and from one manufacturer.
- E. Valves and appurtenances shall have the name of the maker, nominal size, flow directional arrows, working pressure for which they are designed and standard referenced, cast in raised letters or via riveted stainless steel nameplate upon some appropriate part of the body.
- F. Unless otherwise noted, items shall have a minimum working pressure of 150 psi or be of the same working pressure as the pipe they connect to, whichever is higher and suitable for the pressures noted where they are installed.
- G. Provide all special adaptors as required to ensure compatibility between valves, appurtenances and adjacent pipe.
- H. No alternative materials will be considered for approval unless complete documentation is provided regarding their satisfactory long-term use in similar conditions; in addition, the consideration of any substitution will be considered only if the superiority of the proposed materials is the intent of the substitution, and only if sufficient evidence is provided to document that superiority.
- I. Manually actuated, valves shall be provided with an operating wheel, handle or AWWA 2-in nut.
- J. Unless otherwise noted, operation for all valves shall be CCW open.

2.02 VALVE ACTUATORS - MANUAL

- A. Nut actuated valves shall be provided where indicated and where installed in valve boxes or accessed through floor penetrations.
 - 1. Provide one tee handle wrench for every four nut actuated valves. Tee handle extension length shall be determined based on the nut height as shown on the Drawings, and coordinated during the submittal process. Tee handle wrench length shall provide tee handle approximately 3 feet above floor of vantage point. Provide one nut wrench for each nut differing 1.5 feet or more from vantage point description.

- B. Geared actuators shall be suitable for all weather service, with mechanical shaft seals, shall be permanently greased, or shall have provisions for greasing. Actuators for submerged duty shall be so rated, with certification by manufacturer for submerged service.
- C. The valve manufacturer shall supply, mount and test all actuators on valves at the factory. The valves and their individual actuators shall be shipped as a unit.
- D. Except as otherwise shown on the Drawings or specified herein, all valves 3-in diameter or larger, with the valve hand wheel center line located 7-ft or more above the operating floor, shall be provided with chain wheel operators complete with chain guides and hot dipped galvanized steel chain, which loop within 4-ft of the operating floor. These requirements shall supersede positioning lever actuator requirements of manual butterfly valves 6 inch and smaller.
- E. All actuators shall be capable of moving the valve from the full open to full close position and in reverse and holding the valve at any position part way between full open or closed.
- F. Each operating device shall have cast on it the word "OPEN" and an arrow indicating the direction of operation.
- G. Floor boxes for operating nuts recessed in concrete shall be standard cast iron type, cast-in-place, with fastening top, and 316 stainless steel hardware.
- H. Stem guides shall be of the adjustable wall bracket type, bronze bushed, with maximum spacing of 10-ft as manufactured by Clow; Rodney Hunt or equal. Extended operating nuts and/or stems shall have universal joints and pin couplings, if longer than 10-ft and a rating of at least five times the maximum operating torque. Stem adaptors shall be provided.
- I. Where required by the installation, or as specified, provide the following: extended stem; floor stand and handwheel; position indicator and etched or cast arrow to show direction of rotation to open the valve; resilient, moisture-resistant seal around stem penetration of slab.
- J. Gear Actuators
 - 1. Unless otherwise noted, gear actuators shall be provided for the following: plug and ball valves larger than 3-in diameter; butterfly valves larger than 6 inch diameter; where specified and/or indicated on the Drawings; where manual operator effort is greater than 40 lbs rim pull.
 - 2. Actuators shall be capable of being removed from the valve without dismantling the valve or removing the valve from the line.
 - 3. Gear actuators for quarter turn valves shall be of the worm or helical worm gear type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on the output shaft. Where shown on the Drawings, a 2 inch cast iron operating nut shall be provided. Actuators shall conform to AWWA C504 except where more stringent requirements are provided hereinafter. Worm shall be hardened steel (get ASTM), driven gear shall be bronze (get ASTM). Surfaces shall be . Bearings shall be permanently lubricated, with bronze bearing bushings provided to take all thrusts and mechanical shaft seals to contain lubricants. Housings shall be sealed to exclude moisture and dirt, allow the reduction mechanisms to operate in lubricant and be constructed of cast iron, ASTM A126, Grade B, or of ductile iron, ASTM A536. Gear housing bodies for thermoplastic valves

may be cast aluminum or fabricated steel to reduce weight. Gear actuators shall indicate valve position and have adjustable stops.

4. Where indicated on the Drawings, gear actuators for butterfly valves shall be of the travelling nut type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on the output shaft. Unless noted they shall conform to AWWA C504. Stem shaft shall be machine cut alloy steel, nut and cross head shall be bronze, lever shall be ductile iron. Nut Actuators for valves 24-in and smaller shall be slotted lever design, actuators for valves greater than 24 inch shall be link and lever design. Mechanism shall be lubricated with water resistant extreme pressure NLGI No. 2 grease. Bevel gear reduction box shall be mounted on the actuator when required to meet specified manual operating effort requirements Gear actuators shall have mechanical, external indication of valve position and have adjustable threaded stops secured to the stem with spring pins. Stop shall be capable of withstanding 450-ft-lb of input torque. Stop adjustment requiring shims are not acceptable.
 5. Manual Input torque to produce required valve operating torque for worm and travelling nut gear operators shall not exceed 80 ft-lbs. In addition, hand wheel rim pull shall not exceed 20 lbs for valve sizes up to 12 inches, 40 lbs for valve size between 14 and 20 inches, 60 lbs for valve size 24 and greater. Minimum hand wheel size shall be 8 inches for up to 12 inch valve size, 12 inches for up to 16 inch valve size, 18 inches for up to 20 inch size.
 6. Gear actuators for multi turn valves shall be of the bevel or spiral bevel type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on the output shaft. Gearing shall be machine cut steel designed for smooth operation. Bearings shall be permanently grease lubricated, with dual anti-friction ball bearings on the output shaft and mechanical shaft seals to contain lubricants. The output flange of the primary gear reducer shall be designed to meet an appropriate MSS or ISO standard to allow mounting to the secondary gear reducer. The ring gear shall ride on ball bearings. The stem nut shall be bronze alloy, shouldered, and ride on needle bearings. Housing components shall be o-ring sealed to exclude moisture and dirt, constructed of cast iron, ASTM A126, Grade B, or of ductile iron, ASTM A536. Gear housing bodies for thermoplastic valves may be cast aluminum or fabricated steel to reduce weight. Manual operator input effort to the hand wheel shall be a maximum of 30 lbs for operating the valve from full open to full close, under any conditions. Maximum hand wheel size shall be 24-in diameter.
- K. Additional valve actuator requirements are included with the individual valve types and as noted in Paragraph 1.02 above.
- L. All position indication and direction of opening arrows shall be embossed, stamped, engraved, etched or raised castings. Decals or painted indications shall not be allowed.
- M. Unless otherwise noted, all valves larger than 3-in nominal diameter shall be provided with position indicators at the point of operation.

2.03 VALVE ACTUATORS - POWERED

- A. Modification of Existing 480 Volt Electric Actuators

1. The existing Limitorque MX 10 actuators noted on the Drawings shall be removed from existing valves and installed on new valves furnished under this Project. The actuator data is as follows:
 - a. Model: MX 10-6,
 - b. Order no: 130985-002 SERIES A
 - c. S/N L990432 SHC 632 (unit no 3)
2. Contractor shall furnish the services of a local representative of the actuator manufacturer-Flowserve to perform the work specified herein.
3. For each actuator, a new analog position transmitter shall be furnished and installed.
 - a. Type: Non-contacting position transmitter
 - b. Accuracy = 99% of full scale (for Drive Sleeve Turns > 50)
 - c. Non-Linearity = $\pm 1\%$ of full scale
 - d. Impedance = 0-600 ohms (4-20mA signal)
 - e. Minimum External Load = 1000 ohms (0-10VDC signal)
 - f. Configurable to allow minimum signal to represent fully open or fully closed.
 - g. Manufacturer(s) = Flowserve Limitorque Analog Position Transmitter (APT)
4. Each actuator shall be mounted on the new valves, adjusted by the certified representative and stroked 5 times to ascertain the stops are properly set.
5. The position transmitter output shall be set and checked for output signal, initial setpoint shall be signal output at 90% of closure. Provide services to adjust this setpoint in the field during start up of the pumping systems.
6. Approved vendors are Quality Controls Inc., Warwick NJ and Raritan Valve Automation, Edison, NJ.

B. General

1. Electric actuators for $\frac{1}{4}$ turn valves three inches and under, which do not have submergence requirements, and which exhibit a maximum torque specified below shall be operated on 120 volt single phase power as specified below. All other actuators shall be operated on 480 volt power.
2. The actuators shall conform to AWWA Standard C540, insofar as applicable and as herein specified. Actuators shall be O-ring sealed, watertight to standard NEMA 4X/6, submersion to 6 feet for 30 minutes. Actuators installed in vaults below grade and elsewhere subject to submergence shall be watertight to standard NEMA 6P/IP68, 15 ft for 72 hours minimum. Actuators installed in hazardous locations as noted on the Electrical Drawings and/or area classification sheets of the Architectural Drawings shall be FM certified explosion proof for Class 1 Division 1 & 2, Groups C & D and also meet the standard NEMA 4X/6 rating.
3. Valve service/operation shall be as indicated on the P&IDs and as specified in the Process Control Strategies in Section 13305.
4. 480 Volt powered actuators shall be Rotork IQ/IQM; Limitorque MX; EIM TEK 2000; AUMA SA/SAR. Actuators shall be configured as required to provide for part turn or

multi-turn and be coupled with gearboxes as required to obtain the speed and operating torque as required for the valve or gate it controls.

5. Modulating actuators shall contain proportional control unit and be capable of 1200 starts per hour, open-closed valve actuators shall not require a proportional control unit, and be capable of 60 starts per hour.
 6. Where shown on the Instrumentation Drawings, actuators shall have a digital control module, to allow valves or gates to be positioned remotely via a 2-wire non-proprietary field bus protocol. The digital control module shall be equipped with serial communication ports to allow actuation to be linked by a two wire local area network utilizing Modbus function code (report by exception) and arranged in a self-healing ring configuration, with multi-drop taps to each actuator.
- C. 120 Volt Single Phase Reversing, Non Spring Return Electric Actuators for ¼ Turn Valves, 100 to 1000 in-lb Torque Range
1. Valve actuators shall be sized by the valve supplier meeting the requirements of AWWA C540. Actuators shall be mounted on the valves in the valve suppliers facility, and factory tested.
 2. Actuators shall operate on 120 volt, 60 hz single phase, power supply. Enclosure rating shall be NEMA 4X, constructed of cast aluminum or steel alloy, powder coated or fusion bonded epoxy finish.
 3. Power train shall be self locking planetary epicyclical gear design, consisting of hardened steel and or hardened bronze alloy gears with bronze bearings. Housing penetrations shall be sealed with mechanical seals. Housing shall be equipped with space heaters. Valve mounting system shall be ISO 5211.
 4. Actuator shall be designed for open/close/jog reversing service. Proportional/modulating service shall be provided where required in the equipment specifications or Instrumentation Drawings. Actuators shall have visual mechanical indication of position. Manual override shall be direct worm drive with minimum 5 inch diameter hand wheel. Hand wheel size shall be provided such that a maximum 40 lb rim pull is required.
 5. Motors shall be designed specifically for valve actuation service, with Class F insulation, with split phase capacitor protection. Duty cycle shall not be less than 40% at 100 deg F. for open/close duty, and 100% for modulating duty. 90 degree travel time shall vary from 10 to 20 seconds depending on actuator size. Actuators shall have SPDT contacts for remote valve position indication.
 6. Actuators shall be P Series as manufactured by Promotion Engineering, Brooksville, FL, or equal.
- D. 480 Volt Powered Actuators for Part Turn or Multi-Turn Valve Operation
1. Operation
 - a. Capabilities shall be provided to position the valve (or gate) locally via the Local/Off/Remote selector switch and Open/Stop/Close push buttons.

- b. For on/off service, when in remote, the actuator shall accept one remote signal to open the valve or gate and a second remote signal to close the valve or gate.
- c. For modulating service, when in remote the actuator shall accept a 4-20mADC position control signal, and shall position the valve 0-100% of travel in proportion to the control signal.
- d. Unless stated otherwise in the valve specifications, the actuator and gearing size shall be designed to operate the valve at a disc speed of 1 foot travel per minute of operation. For quarter turn valves, valves shall rotate from stop to stop in 30 seconds per foot of throat diameter.

2. Functional

- a. The motor operated valve controller shall include the motor, operator unit gearing, limit switch gearing, limit switches, control power transformer, position transmitter (when required), torque switches, bored and key-wayed drive sleeve for non-rising stem valves, declutch lever and auxiliary handwheel as a self-contained unit. Valve contacts shall be capable of handling the current equivalent of a NEMA 1 size starter.
- b. Reversing starters shall be integral with the actuator, and shall be solid-state starters for modulating service. Electro-mechanical reversing starters shall be acceptable for open-close service and shall be mechanically and electrically interlocked.
- c. Limit switches and gearing shall be an integral part of the valve control. The limit switch gearing shall be made of bronze or stainless steel and shall be fully lubricated, intermittent type and totally enclosed to prevent dirt and foreign matter from entering the gear train. Limit switches shall be of the adjustable type capable of being adjusted to trip at any point between fully opened valve and fully closed valve. Limit and torque switches shall be provided for stopping valve in both directions. Mid-travel switches shall be provided as required. Set position shall not be lost if over travel occurs in either manual or electric modes of operation.
- d. The valve position transmitter shall be a gear actuated, two-wire device, producing 4-20 mADC signal proportional to 0-100% of valve travel. The transmitter shall be provided with easily accessible zero and span adjustment potentiometers. The DC power supply shall be provided integral with the operator and powered from the 110 volt AC internal transformer. The positioner board shall provide repeatable accuracy to 0.25% of span. There shall be separate trim pots on the positioner board for zero, span and dead band adjustment.
- e. The speed of the actuator shall be the responsibility of the system supplier with regards to hydraulic requirements and response compatibility with other components within the control loop. Each valve controller shall be provided with a minimum of two limit switch functions, one for opening and one for closing. Each limit switch will have two normally open and two normally closed contacts. Gear limit switches must be geared to driving mechanism and in step at all times whether in motor or manual operation. Provision shall be made for two extra sets of limit switches as described above, each to have two normally open and two normally closed contacts. Each valve controller shall be equipped with a double torque switch. The torque switch shall be adjustable and will be responsive to load encountered in either direction of travel. The limit and torque switch contacts shall be silver inlay type.
- f. Each actuator shall include monitor relays to remotely indicate fault signal for indication of power failure, phase failure, thermal switch tripped, torque switch tripped between travel stops and Local-Off-Remote selector switch position.

3. Physical

- a. The operator shall be equipped with open-stop-close push-buttons, a local-off-remote selector switch and indicating lights all mounted on the operator. Where operator will not be situated between 2-ft-0-in and 7-ft-0-in above the operator platform, and where shown on the Drawings, provide a separate remote valve operating station.
 - b. The motor shall operate on 460 volt, 60 hertz, 3 phase power and shall be sized by the actuator manufacturer to provide the required output torque for the service intended. The motor shall have Class F insulation, with a duty rating of at least 15 minutes at 40 degrees C ambient temperature. The motor shall be specifically designed and built by the actuator manufacturer for electric actuator service. Commercially available motors shall not be acceptable. The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel regardless of the connection sequence of the power supply.
 - c. Operators utilizing multiple reduction power gearing shall consist of spur, helical, or bevel gearing and worm of hardened alloy steel, and the worm gear shall be alloy bronze. Operators utilizing single-stage reduction shall be single-stage worm gear totally enclosed in a fully lubricated gearcase, with filling and drain plugs. Non-metallic, aluminum, or cast gearing shall not be allowed. The output shaft shall incorporate thrust bearings of the ball or roller type at the base of the actuator.
 - d. An operating wheel shall be provided for manual and/or emergency operation, engaged when the motor is declutched by a lever or similar means, the drive being restored to power automatically by starting the motor. The operating wheel drive must be mechanically independent of the motor drive, and any gearing shall be such as to permit emergency manual operation, using a 40 pound force in a reasonable time. Clockwise operation of the handwheel shall give closing movement of the valve unless otherwise stated.
 - e. Each actuator shall be supplied with a start-up kit including installation instructions, wiring diagrams, and spare cover screws and seals to provide for losses during commissioning.
 - f. Continuous mechanical dial indication of valve position shall be provided. The mechanical dial position indicator shall be in step with the actuator at all times in both the hand wheel and motor operation. For modulating applications, the mechanical dial position indicator shall include graduations of 0-100 percent scale.
4. Wiring and Terminals
- a. Internal wiring shall be of tropical grade PVC insulated stranded cable of 5 amp minimum rating for control circuits and of appropriate size for the motor 3 phase power. Each wire shall be clearly identified at each end.
 - b. The terminals shall be of the stud type embedded in a terminal block of high tracking-resistance compound. The 3-phase power terminals shall be shrouded from the control terminals by means of an insulating cover.
 - c. The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal. The terminal compartment of the actuator shall be provided with three threaded cable entries.
 - d. Each actuator shall be provided with a commissioning kit consisting of a wiring diagram and installation and operation manual. A separate wiring diagram shall be provided inside the terminal cover. No special tools, devices or parts shall be required for commissioning.
 - e. Actuators shall have separately sealed motor and control compartments. All operators shall have space heaters in their limit switch, motor, and control compartments.
5. Remote Control Stations

- a. Where shown on the Drawings, or where specified in the Equipment Specifications, valve actuators shall be furnished with control stations suitable for mounting remotely from, but, in the vicinity of the actuator. Remote mount control station shall include a Local - Off - Remote selector switch, Open - Stop - Close pushbuttons and Open - Close indicating lights. Control station operators shall be heavy duty devices mounted in a cast iron, cast aluminum, or stainless steel NEMA 4X enclosure suitable for wall mounting. Wire gage and device quality shall meet or exceed the requirements of Division 16. The Local - Off - Remote selector switch shall have auxiliary contacts for remote indication of switch position. The Local - Off - Remote selector switch shall have provisions for padlocking in the "Off" position. Additional functionality and/or devices to those specified above are detailed on the Instrumentation P&IDs and/or Electrical Control Schematic drawings. Refer to Drawings for confirmation of the scope of the Remote Control Stations.

6. Performance Test

- a. Each actuator must be shop performance tested, and individual test certificates shall be supplied without additional charge to the Owner. Test certificates shall be submitted prior to shipment of valve actuators. The test equipment shall simulate a typical valve load, and the following parameters shall be recorded:
 - 1) No load current
 - 2) Current at maximum torque setting
 - 3) Stall current
 - 4) Torque at maximum torque setting
 - 5) Stall torque
 - 6) Test voltage and frequency
 - 7) Flash test voltage
 - 8) Actuator output speed

2.04 GATE VALVES- TAG TYPE NOTED BELOW

A. General Requirements

1. Unless otherwise specified below, these requirements shall apply to all gate valves.
2. Gate valves shall meet the requirements of AWWA C500, AWWA C509 and AWWA C515 as applicable to the type of valve specified.
3. Submerged valves shall be furnished with mechanical joint ends and 316 stainless steel hardware; non-rising stem design. Flanged ends shall be provided if so indicated on the Drawings. Non-rising stem valves shall utilize a minimum of two O-ring stem seals. Mechanical joint bolting shall be 316 stainless steel with silicone bronze nuts.
4. Exposed valves shall be furnished with ANSI B16.1, B16.42 or B16.5 Class 125/150 flanged ends as applicable to specified body material. Valve dimensions shall be per ANSI B16.10. Exposed valves shall be bolted bonnet, outside screw and yoke, unless otherwise noted on the Drawings. Flange, bonnet and packing gland bolts shall be Type 316 stainless steel. Where bolts utilize nuts (bolts not threaded into casting), nuts shall be silicone bronze. Where bolting is threaded into stainless steel castings, bolting shall be Nitronic 50.

5. Rising stem valves shall be sealed with adjustable and replaceable packing; valve design must permit packing replacement under operating system pressures with only moderate leakage.
6. Unless otherwise specified, valves shall be rated at or above for the following working water pressures:

<u>Valve Size</u>	<u>Pressure (psig)</u>
3-in to 12-in	250
14-in to 30-in	150
36-in and greater	as specified

- a. All valve bodies shall be hydrostatically tested to at least twice the rated working water pressure. In addition, valves shall be seat-tested, bi-directional at the rated working pressure, with seat leakage not to exceed one fluid ounce per inch of valve diameter per hour. Provide certificates of testing.
7. Flanged valves to have face-to-face dimensions per ANSI B16.10 and flanges per ANSI B16.1.
8. Exposed valves 18-in and larger shall have valve by-pass, by-pass valves shall be of same disc type as main valve and shall meet these specifications.
9. Exposed valves 16-in and greater indicated for horizontal stem installation shall be furnished with rollers, tracks and scrapers and enclosed bevel gear grease case.
10. Provide geared operator and chain wheel, chain and chain guides for valves with handwheel centerline more than 7-ft above operating level.
11. All valves shall be marked per AWWA Standards, including name of manufacturer, valve size and working pressure and year of manufacture.
12. Unless otherwise indicated, valves 12-in and smaller shall be capable of installation in the vertical or horizontal position, and sealing in both directions at the rated pressure.

B. Valve Applications

1. Valves for Potable Water Service:
 - a. Double disc design manufactured by Kennedy/ M&H/ Clow Valve.
 - b. Double revolving disc manufactured by American R/D Valve; Anchor Darling.
 - c. Solid wedge-resilient seated design as manufactured by Mueller Co; J&S Valve; M&H/Clow Valve; American Flow Control; American R/D Valve.
2. Valves for Wastewater Service:
 - a. Solid wedge metal seated design manufactured by M&H Valve; J&S Valve, American R/D Valve; Stockham Valve, or Walworth.
 - b. Solid wedge-resilient seated design as manufactured by Mueller Co; J&S Valve; M&H/Clow Valve; American Flow Control; American R/D Valve.
3. Valves for Saline Water Service:

- a. Solid wedge metal seated design as manufactured by Shipham Valve, Sugarland TX; Xanik valve,

C. Valve Requirements

1. Double Disc: Tag Type GV1
 - a. Conform to AWWA C500.
 - b. Wedging surfaces shall be bronze, Monel or stainless steel.
2. Double Revolving Disc: Tag Type GV2
 - a. Conform to applicable provisions of AWWA C500.
 - b. Wedging surfaces shall be Monel or hardened stainless steel.
 - c. Discs fully free to rotate, guided in travel by cast surfaces.
 - d. Disc rotation shall produce a self-cleaning action during opening or closing.
 - e. Wedging forces applied only when discs are in seating position.
3. Solid Wedge Metal Seat: Tag Type GV3
 - a. Conform to AWWA C500
 - b. All-metal valves shall be manufactured of ASTM A126 Cast Iron, Class B. Wedge seating surfaces and body seat rings shall be cast from B62 bronze.
 - c. Shall be coated internally and externally with an asphaltic varnish, per AWWA C500.
 - d. Body shall have tongue and grooved guides for wedges.
 - e. Rollers, tracks and scrapers shall be provided for valves 16-inches and larger, constructed of 316 stainless steel.
4. Solid Wedge Resilient Seated- Water and Wastewater Service: Tag Type GV4
 - a. Resilient seated valves shall be manufactured of ASTM A536 ductile iron, vulcanized rubber disc per AWWA C509, manganese bronze or Type 316 stainless steel stem and trim, full port design, Type 304 or Type 316 stainless steel fasteners as required in general requirements. Valves shall conform to AWWA C509 and be UL and FM approved.
 - b. Shall have internal and external fusion bonded epoxy coating of valve body, including bonnet, per AWWA C550.
 - c. Gate shall be encapsulated with EPDM ASTM D2000. It shall be bonded and vulcanized in accordance with ASTM B429 Method B.
 - d. Shall have no recesses in valve body.
5. Solid Wedge Metal Seated- Saline Water Service: Tag Type GV5
 - a. ANSI Class 150
 - b. Body, disc and bonnet shall be cast duplex stainless steel A995, Grade CD3MN.
 - c. Stem shall be duplex stainless steel S31803.
 - d. Disc and body seat facings shall be hardened.
 - e. Stem threads shall be rolled

D. Gate Valves 3 inch and Smaller: Tag Type GV6

1. Gate valves 2.5-in diameter and smaller shall have screwed ends and shall be bronze body. Gate valves 3-in diameter shall be flanged end, iron or bronze body. Gate shall be brass, bronze, or Type 304 stainless steel solid wedge; union bonnet; silicon bronze rising-stem; equal to Jenkins Figure 47CUJ, division of Crane Valve Group; Lunkenheimer Figure 3127, Cincinnati Valve Co, Fairbanks Figure U-0252, or equal. Model numbers referenced

above are for screwed ends, flanged shall be equal construction with appropriate end connections. Iron body valves shall be installed in steel or iron pipelines.

E. Tapping Valves and Sleeves: Tag Type TPGV

1. Under no circumstances shall a standard gate valve be used for a tapping valve. Tapping valves shall comply with the same requirements as solid wedge, resilient seat or double disc gate valves except they shall have the flanged end and port opening modified for tapping service. Tapping valves shall be provided with plugged flush port at bottom of gate guide and plugged tap for pressure/leak testing. Valves shall be capable of passing a full nominal sized cutter without damage to the valve. The tapping sleeve shall be gray cast iron or ductile iron mechanical joint type with the outlet flange conforming to MSS-SP-60.

2.05 PLUG VALVES

A. Eccentric Rectangular Port, Tag Type PV1

1. Plug valves shall be of the offset disc type, 1/4 turn, non-lubricated, serviceable (able to be repacked) under full line pressure and capable of sealing in both directions at the rated pressure. The disc shall be completely out of the flow path when open. Plug valves specified herein shall be manufactured by DeZurik; M&H Valve or approved equal. All manufacturers named or otherwise, must comply completely with this Section.
2. The minimum port area shall be 80 percent when measured by the percent cross-sectional area of equivalent size (nominal same diameter) pipe.
3. All plug valves shall be capable of passing "pigging" cleaning equipment (using a Girard or similar cleaning pig of full nominal pipeline diameter) in either direction and manufacturer shall so certify that this may be done without the use of special equipment.
4. Valves shall be rated at minimum 175 psi WOG (Water, Oil and Gas) working pressure for sizes 4-in to 12-in inclusive and at minimum 150 psi WOG working pressure for sizes 14-in and larger and shall be capable of providing drop tight shut-off to the full valve rating with pressure on either side of the plug.
5. Valves shall be performance, leakage and hydrostatically tested in accordance with AWWA C504, except as modified herein.
6. At the above rated minimum working pressures, the valves shall be certified by the manufacturer as permitting zero leakage for a 5-minute duration with full pressure applied in either direction.
7. At the direction of the Engineer, the valve manufacturer may be requested to perform a valve seat leakage test, witnessed by the Engineer to prove compliance with this Section.
8. Valve bodies shall be of cast iron, 30,000 psi tensile strength, ASTM A126, Grade B, or of ductile iron, ASTM A536 and of the top entry, bolted bonnet design, cast with integral flanges conforming to the connecting piping. All exposed bolts, nuts and washers shall be zinc or cadmium-plated, except for submerged valves, which shall have Type 316 stainless steel hardware.

9. Valve bodies shall be glass lined for plug valves installed in glass lined ductile iron pipelines. Glass lining shall be as specified in the piping specification.
10. The valve plug:
 - a. Shall be cast iron ASTM A126, Grade B, or ductile iron, ASTM A536, Grade 65-45-12 with a vulcanized elastomeric coating as specified later herein.
 - b. Shall be removable without removing the valve from the line.
 - c. Shall have an integral upper and lower shaft which shall have seals on the upper and lower journals to prevent entrance of solids into the journals.
 - d. Shall be one piece for all valves.
11. Shaft bearings shall be permanently lubricated stainless steel or bronze at both upper and lower stem journals. The operator shaft shall have easily replaceable seals, which shall be externally adjustable and repackable without removing the bonnet from the valve, or shall have self adjusting packing.
12. The valve seating surface shall provide full 360 degree seating by contact of a resilient seating material on the plug mating with welded-in high nickel content overlay seating surface in the body.
13. The seating design shall be resilient and of the continuous interface type having consistent opening and closing torques and shall be non-jamming in the closed position. Screw-in seats shall not be acceptable.
14. Plugs shall have a full resilient facing of neoprene or Buna-N.
15. Valves 6 inch and larger shall be actuated via gearbox and hand wheel, unless mechanized, which shall require gearbox and actuator. A suitably sized steel actuator mounting bracket shall be provided to provide an air gap between the actuator and the valve stem seal. Under no circumstance shall the gear box be mounted directly to the top body flange such that leakage could directly enter the gear box.
16. Unless otherwise required due to location or mechanized operation, each valve 4-in and smaller shall be provided with its own securely attached lever. Provide adjustable limit stops for both opening and closing and a clearly marked position indicator.
17. Plug valves shall be installed so that the direction of flow through the valve and the shaft orientation is in accordance with the manufacturer's recommendations. Unless otherwise noted, shaft shall be installed horizontal, with plug opening up.

B. Round, Full Port Plug Valves, Tag Type PV2

1. Round full port plug valves shall be equal in all respects as Tag Type PV1 except plug shape shall provide for a round, 100% open area viewing the open valve from the end.
2. Valves 6 inch and larger shall be actuated via gearbox and hand wheel, unless mechanized, which shall require gearbox and motor actuator. A suitably sized steel actuator mounting bracket shall be provided to provide an air gap between the actuator and the valve stem seal. Under no circumstance shall the gear box be mounted directly to the top body flange such that leakage could directly enter the gear box.

3. Valves shall be GA ECO Centric, Pratt Ball Centric, Milliken, or equal.

2.06 CHECK VALVES

A. Iron Body Swing Check Valves for Metallic Lines of 4-in to 30-in Diameter: Tag Type SCV1

1. Check valves shall be swing type and shall meet the requirements of AWWA C508. The valves shall be iron body, bronze mounted, single disc, minimum 175 psi working pressure for 4 to 12 inch, 150 psi working pressure for 14 to 30 inch, non-shock and hydrostatically tested at 300 psi. When there is no flow through the line, the disc shall hang lightly against its seat in practically a vertical position. When open, the disc shall swing clear of the waterway. Valves shall be so constructed that disc and body seat may easily be removed and replaced without removing the valve from the line.
2. Check valves shall have bronze seat and body rings, bronze or ductile clapper arm and bronze nuts on the bolts of bolted covers. Shaft assembly and key shall be A582 Type 416 stainless steel. Hinge shaft shall extend from the body of the valve, sealed with stuffing box, packing and gland. Shaft side plug bearing, stuffing box and gland shall be bronze, packing shall be reinforced Teflon.
3. Valves 6 inch and larger shall be fitted with an extended hinge arm with outside lever and weight. The position of the weight shall be adjustable. Various weights shall be provided and installation approved by the Engineer. Lever shall be installed to the horizontal in the closed position, for both horizontal and vertical pipeline installations.
4. Where check valve position switches are required as shown on the Instrumentation Drawings, check valves shall be furnished complete with position switch mounting bracket and actuation lever mounted to the stem shaft. Where outside lever and weights are required, stem shaft shall extend both sides of the valve body and position switch assembly shall be mounted on the opposite side of the lever and weight assembly.
5. Where position switches are to be supplied for existing check valves with external shaft and lever, supply mounting brackets and hardware required to mount position switches to the existing valves. Contractor shall use existing bolting where possible to mount brackets. If bolting is not available in required area, contractor shall drill and tap valve body if required to mount the position switches. Drill location and depth shall be reviewed with, and approved by the Engineer.
6. Position switches shall be lever type, NEMA 7 enclosure, SPST, 120VAC, 6A, Square D Type 9007CR or approved equal. All hardware shall be Type 316 stainless steel.
7. Check valves shall be manufactured by American Flow Control; M&H/Clow/Kennedy; GA Industries; Mueller or approved equal.

B. Alloy Stainless Steel Swing Check Valves for Saline Water Service: Tag Type SCV2

1. Shall be ANSI 150 Lb design.
2. Body and disc shall be cast duplex stainless steel A995, Grade CD3MN.

3. Hinge shaft and key shall be Nitronic 50 or Alloy 2205 duplex stainless steel Hinge shaft shall extend from the body of the valve, sealed with stuffing box, packing and gland. Shaft side plug bearing, shall be reinforced glass composite or monel, stuffing box shall be Alloy 2205, and gland shall be 316 stainless steel, packing shall be reinforced Teflon, both side plug and stuffing box shall be provided with grease fittings.
4. Lever shall be 304 or 316 stainless steel, weight shall be cast iron or steel.
5. Cover bolting shall be 316 stainless steel, all wetted bolting shall be Nitronic 50 or Alloy 2205.
6. Disc and body seat facings shall be hardened.
7. Where position switches are required, they shall meet requirements of Paragraph 2.08A above.

C. Swing Check Valves 3 inch and Smaller: Tag Type SCV3

1. Check valves 2-in and smaller for installation in copper and steel pipes shall be bronze, swing type, bronze disc, stainless steel pin, 125 lb with solder or screwed ends. Solder or thread end check valves 3-in and smaller shall be similar to Hammond 1B-940, or Jenkins Figure 996. Flanged end check valves 2 to 4-in in water service shall be Bronze fitted Hammond 1R-1124 or Jenkins Figure 587J.

D. Ball Check Valves for Submersible Pump Discharge: Tag Type BCV

1. Body shall be cast iron, ASTM A126, Class B, threaded or flanged. Sinking ball shall be type fabricated of hollow steel with vulcanized Nitrile rubber covering. Ball check valves shall be Type 2016 for up to 3 inch, Type 5087 4 inch and larger, as manufactured by Flygt Corporation, equal by Water Resources Technologies, GA Industries Figure 240/242 or equal.

E. Rubber Flapper Check Valves: Tag Type RFCV

1. Body shall be cast iron, ASTM A126, Class B, or ASTM A536 Gr 65 Ductile iron, 150 lb flanged. Body shall be fusion bonded epoxy coated. Disc shall be Nylon reinforced EPDM encapsulated steel. Valve body and open disc shall provide full flow at least equal to nominal pipe diameter. Seating surface shall be on a 45-degree angle. Top access port shall be full size, allowing disc removal without removing valve body from pipeline. Disc shall be one piece construction, precision molded with and integral o-ring sealing surface and contain steel and nylon reinforcements in both the flex and central disc areas.
2. Rubber flapper check valves shall be as manufactured by Crispin Multiplex Series 500, equal by Val-Matic or equal.

2.07 BALL VALVES: TAG TYPE NOTED BELOW

A. General Service Ball Valves: Tag Type BV1

1. Valves shall be bronze or stainless steel to match the piping material, resilient seated, full port, threaded or solder end three piece bolted body type valves. Manual valves shall have locking levers. The body and cap shall be ASTM B584 brass or 316 stainless steel, SAE Grade 8 steel body bolts, the ball and stem of Type 316 stainless steel and the seats and seals of glass reinforced TFE. The balls shall be full floating, non-lubricated. Valve seats shall be easily accessible and replaceable.
2. Valves shall be Apollo Series 82-100/200, Milwaukee BA-300 series; or equal.

B. Flanged Iron Body Ball Valves Tag Type BV2

1. Valves shall be cast or ductile iron body with interior and exterior epoxy coating, full port design. Flanges shall be flat faced Class 125 lb, valve face to face dimensions shall be equal to ANSI 16.10 for gate valves. Ball shall be 316 stainless steel or PFA infused cast iron, seats and seals shall be reinforced PTFE. Valves 4 inch and larger shall be provided with gearbox and handwheel.
2. Valves shall be Sureflow type 125BVIS, American Valves Series 4000; or equal

2.08 GLOBE VALVES: TAG TYPE GLV

- A. Globe valves 3-in diameter and smaller shall have flanged, or screwed ends as required and shall be bronze body, union or bolted bonnet, renewable full plug stainless steel disc, renewable hardened stainless steel seat ring, rising silicon bronze stem, pressure class 200. Globe valves shall be Figure 3245P as manufactured by Walworth Co.; Valley Forge, PA; Jenkins Figure 592J, division of Crane Valve Group; Stockham Figure B-62; Lunkenheimer Figure 73-PS, Cincinnati Valve Co, Fairbanks Figure 0505, or equal. Model numbers referenced above are for screwed ends, flanged ends shall be provided where shown on drawings and shall be equal construction with appropriate end connections. Iron body valves shall be installed in steel or iron pipelines.

2.09 THERMOPLASTIC VALVES- TAG TYPE NOTED BELOW.

A. General

1. All valves shall be certified as completely compatible with the intended and specified service; compatibility shall apply to the material of the valve and internal components, including all seals, gaskets, O-rings and washers; solvents and primers used in valve joint make-up shall be specifically in conformance with the written instructions of the valve supplier. Service chemicals and service conditions are shown in the piping sections in Division 15.
2. Except as otherwise specified valve ends shall be socket-type designed for solvent welding. Solvent and primer shall be as specified in the piping specifications, except that valves installed in systems carrying strong oxidizing, high alkalinity, and strong acid solutions shall contain NO fumed silica, cement shall be Weld-On 724, primer shall be Weld-On 70 for PVC and CPVC pipe as manufactured by IPS Corp., Compton, CA or Oatey Low VOC EP 42 Heavy Duty Industrial Gray as manufactured by Oatey Corp., Cleveland OH.
3. Valve body material shall be the same as the piping system in which the valve will be installed, unless explicitly stated otherwise on the Drawings or in the valve specification.

- a. PVC shall be Type 1, Grade 1, per ASTM D1784 classification, made from unplasticized polymer, and generally suitable for service to 120 degrees F.
 - b. CPVC shall be Type 4, Grade 1, per ASTM D1784, classification generally suitable for service to 180 degrees F.
 - c. Polypropylene (PP) shall conform to the material requirements of ASTM D4101 for copolymer polypropylene.
 - d. PVDF (polyvinylidene fluoride) shall be manufactured from high molecular weight polymers of vinylidene fluoride.
 - e. The manufacturer of the valves shall retain material source quality documentation and shall furnish it to the Engineer upon request.
4. Unless otherwise specified:
- a. Valve seats shall be Teflon, or Teflon encapsulated elastomer. Alternative materials shall not be substituted without complete documentation provided to the Engineer of service suitability.
 - b. Flange Gaskets shall be low torque, full face ANSI B16.5 with two concentric convex rings between ID and bolt hole diameter, constructed of EPDM, PTFE-bonded EPDM or PVDF-bonded EPDM as manufactured by Asahi of America or equal. Flange gaskets shall be appropriate for the fluid service. Documentation shall be provided to show compatibility of the bonded surface material for the fluid service intended.
 - c. Valve external hardware shall be Type 316 stainless steel. No internal metallic components shall be exposed to the service fluid.
 - d. No factory or field coatings shall be applied to the valves.
5. All valves, except butterfly valves shall have a non-shock service pressure rating of not less than 120 psig at 70 degrees F.
6. All valves shall be given hydrostatic and pressure and leakage tests at the factory. Provide certified copy of test results.
7. Valves shall be the standard, catalogued products of the following manufacturers:
- a. Chemtrol
 - b. Asahi/America
 - c. Plast-O-Matic
 - d. George-Fischer
8. Valves specified as furnished with equipment or equipment systems shall comply with these requirements.
- B. Ball Valves: Tag Type Noted Below
1. Ball valves shall be the double-union type, unless otherwise specified, full-port, adjustable seats.
 2. Provide quarter-turn manual valve operator unless mechanized actuators are specified on the Drawings.
 3. Tag Type TBV1- General Service. Shall be PVC body, furnished with socket ends, EPDM O-rings and stem seals, PTFE seats with EPDM O-ring backup.

4. Tag Type TBV2- Sodium Hypochlorite Service, Emulsion Polymer Service. Shall be PVC body, furnished with socket ends, Viton B O-rings and stem seals, PTFE seats with Viton B O-ring backup. Sodium hypochlorite service ball valves shall have the ball drilled to permit venting of pressure and gas from the confined ball cavity, when the valve is closed. The drilling shall vent to the vented portion of piping in which the valve is installed. The drilling shall be 1/8-in opening, de-burred.

C. Butterfly Valves: Tag Type TBFV

1. Valves shall be of the lined body design with only the liner, seals and disc as wetted parts. The liner shall be molded and formed around the body, functioning as a gasket on each side of the valve. Double O-ring seals on top and bottom disc trunnions will fully isolate a Type 316 stainless steel straight-through stem. Body and disc shall be [PVC, PP, PVDF], Liner (seat) shall be [EPDM, FKM, NBR], o-rings shall be [EPDM, FKM, NBR]. [Note-EPDM is not compatible with oil used in emulsion polymer, and marginally compatible with concentrated sodium hypochlorite. FKM, specifically Viton Grade B shall be used for these applications.]
2. The valves shall be wafer style, and lug style for dead-end service as applicable.
3. Each valve shall be furnished with a lever actuator on sizes through 6-in; gear operator on sizes 8-in and larger.
4. Butterfly valves shall be Type 57 as manufactured by Asahi-America or equal.

D. Diaphragm valves: Tag Type TDV

1. Valves shall have double-union ends. Acid service valves shall have flanged ends.
2. Acid service body and bonnet shall be PVDF, ASTM D3222 Cell Classification Type II.
3. Diaphragms shall be single layer EPDM or Viton as the service requires or shall be two layer, non-laminated. Acid service diaphragms shall be non-laminated, layered EPDM, PVDF gas barrier, PTFE wetted.
4. The valve shall have a full-width weir, designed for throttling, and complete bubble-tight closure.
5. Provide a handwheel valve operator, with a stainless steel stem, a cast stem sleeve and a clear plastic stem cover with a position indicator; provide an adjustable limit stop to prevent over-travel.
6. Diaphragm valves shall be Type 14 as manufactured by Asahi-America or equal.

E. Gate Valves: Tag Type TGV

1. Gate valves 1 ½ inch to 14 inch shall be non-rising stem, PVC body, flanged ends, polypropylene plugs and viton seals. Valves shall be provided with 2 inch operating nut or handwheel as indicated on the Drawings. Valves shall have drain port in the seating area. Valves shall be Type P as manufactured by Asahi-America or equal.

F. Needle Valves: Tag Type TNV

1. Needle valves shall be designed for close control of flow throttling with a multi-turn valve handle. Valves shall have FPM seal, PTFE seat. Stem shall be 20 or 24 pitch for fine throttling control. Valve shall have lugs or panel screw on bonnet for panel mounting.
2. Needle valves shall be as manufactured by Chemline Plastics Limited, George Fischer, or equal.

G. Ball Check Valves: Tag Type TBCV

1. Ball check valves shall be double-union style with socket ends, solid and completely spherical ball, EPDM seals, PTFE seat, capable of either horizontal or vertical mounting.

H. Diaphragm Check Valves: Tag type TDCV

1. Diaphragm check valves shall be union PVC, CPVC or PVDF body, thread or socket weld ends, EPDM or FKM diaphragms. Acid service valves shall be PVDF body with FKM diaphragm, and shall be furnished with PVDF flanges to connect to flanged piping. Valves shall be mountable in any position, and shall be Plast-O-Matic model CKM or equal.

I. Swing Check Valves: Tag Type TSCV

1. Swing check valves shall be flanged body; seats and seals shall be EPDM, FKM or PTFE as required by fluid service; disc serviceable from top entry without removing valve, o-ring sealed top flange, ANSI flanged ends. Outside lever and weight and limit switch mounting shall be provided where shown on the drawings.

J. Backpressure Regulating/Control Valves: Tag Type TBPV

1. Backpressure control valves shall be spring-loaded diaphragm design, fully-adjustable pressure setting, set to assure continuous positive pressure at the pump discharge.
2. Furnish with reinforced Teflon diaphragms and elastomer-coated springs.
3. Body shall be of same material as pipeline in which it is installed or, CPVC if not otherwise specified. Valves shall be manufactured by Plast-O-Matic, or equal.

K. Pressure Relief Valves: Tag Type TPRV

1. Relief valves shall be spring opposed, angle-pattern design, with adjustable relief pressure and locking nut. Pressure shall be adjustable over range up to 100 psig.
2. The valve spring shall be elastomer-coated and isolated from the process flow. Elastomer shall be compatible with the fluid service. Diaphragm shall be reinforced Teflon.
3. Relief valves shall be piped as indicated, and if not indicated, the relief piping shall be directed to the floor or adjacent gutter or drain.
4. Pressure relief valve settings shall be set to a pressure as recommended by the pump or equipment supplier and adjusted at the time of equipment testing, inspection and start-up.

5. Body shall be of same material as pipeline in which it is installed or, CPVC if not otherwise specified. Valves shall be equal to Model RVD by Plast-O-Matic; Type A by Asahi-America or equal.

2.10 NEEDLE VALVES: TAG TYPE NV

- A. Needle valves shall have a cast bronze or 18-8 stainless steel body, minimum pressure class 200. Ends shall be ANSI B2.1 threaded. The valves shall have a rising bronze stem and non-slip resilient rubber-coated malleable iron hand wheel.
- B. The needle valves shall be Figure 1976 as manufactured by the William Powell Company, Cincinnati, OH, or Figure 88 as manufactured by Crane Company, Valve Division, Chicago, IL; Lunkenheimer Figure 906-BS or equal.

2.11 PRESSURE REGULATING VALVES: TAG TYPE PCV

- A. Pressure regulating valves shall be factory tested. Outlet pressure shall be easily field-adjustable over the pressure ranges and criteria noted on the Drawings.
- B. Threaded pressure regulating valves shall have unions mounted in the pipe on each side of the valve.
- C. Strainers shall be provided up stream of all pilot valves and hydraulic components associated with the main valve. The pressure regulating valve manufacturer shall specify the screen mesh or size of perforations that are required to protect the regulating valve or hydraulic component. Strainers shall be constructed of 316 stainless steel.
- D. Pressure Regulating Valves - 3-in and larger
 1. Valves 3-in and larger and for pressure regulating shall be flanged with globe body, fully bronze mounted, external pilot operated, spring-loaded diaphragm type single seat with seat base equal to size of valve and shall be equal to the Figure x-4500D (with an industrial chrome finish) Pressure Reducing Valve as manufactured by GA Industries Inc., Pittsburgh, PA; Clayton Model 90 by Cla-Val Company, Newport Beach, CA; Bailey, Fresno, CA; similar models by Ross; OCV; Watts/Muesecos or equal.
 2. The valve shall be packed with leather material acceptable to the Engineer to ensure tight closure and prevent metal to metal friction and sticking. The valve shall be furnished with indicator rod, to show position of opening of the piston, and pet cocks for attachment to valve body for receiving gauges for testing purposes.
 3. The pilot valve, controlling operation of the main valve, shall be easily accessible and so arranged to allow for its removal from the main valve, while the main valve is under pressure. The pilot valve shall be easily adjustable without removal of the springs, weights or use of special tools. The control piping on the valves shall have strainers to prevent plugging of control mechanisms.
 4. The design shall be such that repairs and dismantling internally of main valve may be made without its removal from the line.
 5. The unit shall be flanged. The valve body shall be constructed of cast iron.

6. The valve shall maintain pre-adjusted downstream pressure for varying rates of flow through the positioning of the diaphragm by the pilot without causing: water hammer or waste of water and without cavitation.

E. Pressure Regulating Valves - 2-in and Smaller

1. Pressure regulating valves 2-in and smaller shall be rated 150 psig working pressure, with bronze and brass body; renewable stainless steel seat and flexible diaphragm of suitable material. Outlet pressure shall be easily field-adjustable over the pressure ranges tabulated.
2. Pressure regulating valves 2-in and smaller shall be Figure No. 43D as manufactured by GA Industries, Inc.; Watts Muesco Regulator Co. Series 115 for 1-1/4-in and larger and Model 223-S for units smaller than 1-1/4-in or equal with strainer and of size noted on the Drawing. Shall be diaphragm type, pressure reducing globe valves designed for an inlet pressure of approximately 110 psig, and outlet pressures in the range of 20 to 60 psig

2.12 SOLENOID VALVES: TAG TYPE SV

- A. Solenoid valves shall be packless piston type direct acting for sizes less than 1-in and internal pilot operated for sizes 1-in and larger, 2-way or 3-way, valves and shall be ASCO Valve; Red Hat by Automatic Switch Co., similar by Circle Seal Controls-Atkomatic Valve Co. or equal for air and water service.
- B. Valves shall be energized to open, except for valves on water seal lines to pumps which shall be energize to close.
- C. Valves shall have forged brass bodies, NPT end connections of the connected piping Type 304 stainless steel internal parts, and Buna-N or Ethylene Propylene valve seats. Valves shall have a minimum 150 psig safe working pressure and zero minimum operating pressure differential. Connections shall be threaded.
- D. Solenoid valves size 2-inch and larger shall be full bore bronze body, Type 430 stainless steel plunger, copper coil class A encapsulated, Type 302 stainless steel spring, wash-down safe, equal to type A as manufactured by Magnatrol Valve Corp., Hawthorne, NJ or equal. Solenoid valves shall have a manual override actuated by a handle levered plunger mounted on the bottom of the valve body. These valves must be mounted in a horizontal run of piping, with the solenoid up in the vertical position.
- E. Note that solenoid valves may be shown on Electrical and/or Mechanical Drawings, or may only be specified, but if so specified or shown, shall be provided. Solenoid valves located in hazardous classified areas shall be provided with electrical enclosures which satisfy the electrical classification as specified or shown on the electrical drawings.

2.13 CORPORATION STOPS: TAG TYPE CS

- A. 3/4" through 2" Corporation Stops shall be ball valve type, meeting AWWA Standard C800-01, Sec. 4.2.3 (High Pressure), withstanding working pressures up to 300 psi. The body, ball, operating stem, T-head, and service line connector shall be manufactured from red brass and conform to ASTM B62 and/or ASTM B584, UNS No. C83600. The ball shall be fluorocarbon coated and shall float on two EPDM seats and be watertight in both directions. The operating stem and nut shall be one piece, held in place by a mating machined flange on the stem and in

the body. The operating stem shall have an EPDM O-ring to provide a watertight seal against the body.

- B. Inlet threads shall be AWWA Taper, except where used with service clamps, where threads shall be IPS threads. All thread types and diameters shall conform to AWWA C800. The inlet threads will be integral to the body. The waterway diameter shall be approximately equivalent to the nominal size of the stop, and shall accommodate the maximum cutter size established by AWWA C800. The outlet shall be a compression connection meeting AWWA C800 Sec. 4.4.9.
- C. Corporation Stops shall be FB Style Ballcorp, as manufactured by The Ford Meter Box Company, Inc., Wabash, Indiana, or equal. Where corporation stops are used with plastic pipe, a brass companion flange shall be provided on the outlet of each corporation stop.

2.14 AIR RELEASE AND VACUUM RELIEF VALVES: TAG TYPE NOTED BELOW

- A. All pipeline air and vacuum valves shall be supplied with isolation gate or ball valves with operator handle or lever removed. Isolation valves shall be of same metallurgy as the connecting piping or nipples.
- B. Relief valves shall be properly vented and piped to drain.
- C. Valve pressure rating shall be at least equal to the attached pipe's rating.
- D. Air and Vacuum valves for sewage service shall have connections for draining and flushing with isolation ball valves for connection size up to 3 inch, and solid wedge gate valves for size 4 inch and larger.
- E. Combination Air and Vacuum Relief Valves: Tag Type CAV1
 - 1. Valves shall be single body, guided float design configured to release large amounts of air during pipeline filling, release small amounts of air accumulated during pipeline operation, and allow large volume of air entry during pipeline draining or vacuum transients. Single or segmented float shall be stainless steel or solid thermoplastic and shall not deform under any operating conditions. The body and float design shall limit the transient pressure rise to not more than twice the valve working pressure. Valve design shall incorporate an over pressure safety feature that will fail without an explosive effect, such as is normally the case when highly compressed air is released suddenly. Valves shall have intake area equal to nominal size of the valve. Valve bodies shall be smooth contoured for solids flushing, and shall have ports for flush and drain. Valve body shall be easily dismantled with single split coupling, top entry bolted flange or be of cylindrical construction with flanged ends secured with external tie rods. Valves shall be rated for 250 psi service pressure.
 - 2. Materials and Manufacturer:
 - a. Body shall be ductile iron, 304 stainless steel or 316 stainless steel.
 - b. Floats shall be HDPE or 316 stainless steel
 - c. Internal wetted components shall be 316 stainless steel
 - d. Seals and elastomers shall be EPDM.
 - e. External bolting shall be 316 stainless steel
 - f. Manufacturer shall be Dezurik/APCO ASU, Vent-O-Mat RGX II, A.R.I. D-026, Dorit DAV.

2.15 SURFACE PREPARATION AND SHOP COATINGS

- A. Notwithstanding any of these specified requirements, all coatings and lubricants in contact with potable water shall be certified as acceptable for use with that fluid.
- B. If not specified herein, coatings shall comply with the requirements of Section 09901 and 09902. In case of a conflict, the requirements of this Section govern.
- C. If the manufacturer's requirement is not to require finished coating on any interior surfaces, then manufacturer shall so state and no interior finish coating will be required, if acceptable to the Engineer.
- D. The exterior surface of various parts of valves, operators, floor-stands and miscellaneous piping shall be thoroughly cleaned of all scale, dirt, grease or other foreign matter and thereafter one shop coat of an approved rust-inhibitive primer such as Inertol Primer No. 621 shall be applied in accordance with the instructions of the paint manufacturer or other primer compatible with the finish coat provided.
- E. Unless otherwise noted, interior ferrous surfaces of all valves shall be given a shop finish of an asphalt varnish conforming to AWWA C509, (except mounting faces/surfaces) or epoxy conforming to AWWA C550 with a minimum thickness of 6 mil.
- F. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating. Mounting surfaces shall be especially coated with a rust preventative.
- G. Special care shall be taken to protect uncoated items and plastic items, especially from environmental damage.

2.16 FACTORY INSPECTION AND TESTING

- A. Factory inspection, testing and correction of deficiencies shall be done in accordance with the referenced standards and as noted herein.
- B. See Division 1 for additional requirements. Also refer to PART 1, especially for required submission of test data to the Engineer.
- C. In addition to all tests required by the referenced standards, the following shall also be factory tested:
 - 1. Pressure regulating valves shall be factory tested at the specified pressures and flows.
 - 2. Butterfly valves shall be factory tested to demonstrate drop tight closure at the specified conditions.
 - 3. All types of air and vacuum valves.

PART 3: EXECUTION

3.01 INSTALLATION - GENERAL

- A. All valves and appurtenances shall be installed per the manufacturer's instructions in the locations shown, true to alignment and rigidly supported. Gearboxes, electric, hydraulic and

pneumatic actuators shall be installed at the valve suppliers facility, completely adjusted and tested. Valve and actuator assemblies shall not be mated in the field under any circumstance.

- B. In no case shall stems be installed upside down- or vertical in the 6 o'clock position. Unless otherwise indicated on the Drawings:
 - 1. Gate, Globe, Ball valves shall be installed with stem vertical in the 12 o'clock position.
 - 2. Plug valves shall be installed with stem horizontal and plug opening to the top of the body unless position will not allow proper actuator access, in which case stem shall be vertical in the 12 o'clock position.
 - 3. Plug valves in horizontal lines shall be installed with the seat upstream. Plug valves in vertical lines shall be installed with the seat facing up.
- C. Install all brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings, or otherwise required. Before setting these items, check all Drawings and figures which have a direct bearing on their location. The Contractor shall be responsible for the proper location of valves and appurtenances during the construction of the work.
- D. All materials shall be carefully inspected for defects in construction and materials. All debris and foreign material shall be cleaned out of openings, etc. All valve flange covers shall remain in place until connected piping is in place. All operating mechanisms shall be operated to check their proper functioning and all nuts and bolts checked for tightness. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced at no additional cost to the Owner.
- E. Where installation is covered by a referenced standard, installation shall be in accordance with that standard, except as herein modified, and the Contractor shall certify such. Also note additional requirements in other parts of this Section.
- F. Unless otherwise noted, joints for valves and appurtenances shall be made up utilizing the same procedures as specified under the applicable type connecting pipe joint and all valves and other items shall be installed in the proper position as recommended by the manufacturer. Contractor shall be responsible for verifying manufacturers' torquing requirements for all valves.

3.02 INSTALLATION OF MANUAL OPERATIONAL DEVICES

- A. Unless otherwise noted, all operational devices shall be installed with the units of the factory, as shown on the Drawings or as acceptable to the Engineer to allow accessibility to operate and maintain the item and to prevent interference with other piping, valves and appurtenances.
- B. For manually operated valves 3-inch diameter and smaller, valve operators and indicators shall be rotated to display toward normal operation locations.
- C. Floor boxes, valve boxes, extension stems and low floor stands shall be installed vertically centered over the operating nut, with couplings as required and the elevation of the box top shall be adjusted to conform to the elevation of the finished floor surface or grade at the completion of the Contract. Boxes and stem guides shall be adequately supported during concrete placement to maintain vertical alignment.

3.03 INSPECTION, TESTING AND CORRECTION OF DEFICIENCIES

- A. See also Division 1. Take care not to over pressure valves or appurtenances during pipe testing. If any unit proves to be defective, it shall be replaced or repaired to the satisfaction of the Engineer.
- B. Functional Test: Prior to plant startup, all items shall be inspected for proper alignment, quiet operation, proper connection and satisfactory performance. After installation, all manual valves shall be opened and closed in the presence of the Engineer to show the valve operates smoothly from full open to full close and without leakage. Valves equipped with electric, pneumatic or hydraulic actuators shall be cycled 5 times from full open to full closed in the presence of the Engineer without vibration, jamming, leakage, or overheating. Pressure control and pressure relief valves shall be operated in the presence of the Engineer to show they perform their specified function at some time prior to placing the piping system in operation and as agreed during construction coordination meetings
- C. The various pipe lines in which the valves and appurtenances are to be installed are specified to be field tested. During these tests any defective valve or appurtenance shall be adjusted, removed and replaced, or otherwise made acceptable to the Engineer. Various regulating valves, strainers, or other appurtenances shall be tested to demonstrate their conformance with the specified operational capabilities and any deficiencies shall be corrected or the device replaced or otherwise made acceptable to the Engineer

3.04 CLEANING

- A. All items including valve interiors shall be inspected before line closure, for the presence of debris. At the option of the Engineer, internal inspection of valve and appurtenances may be required any time that the likelihood of debris is a possibility. All pipes and valves shall be cleaned prior to installation, testing disinfection and final acceptance.

3.05 DISINFECTION

- A. Disinfection of valves and appurtenances on all potable water lines and where otherwise noted, shall be as noted in Paragraph 1.02B above.

END OF SECTION

SECTION 15101

VALVE SCHEDULE

PVSC 15-DIGIT ASSET I.D. NUMBER DESIGNATION	CONTRACT DRAWINGS VALVE DESIGNATION	VALVE SIZE	VALVE TYPE	VALVE OPERATOR	JOINT CONNECTION	REMARKS
	BV 511-514	10-INCH	BV2	HW	FLG	
	FCV 511-514	10-INCH	PV2	MO	FLG	Re-use existing actuators
	PV 511-514	10-INCH	PV2	HW	FLG	
	PV-515	16-INCH	PV2	HW	FLG OR VIC	
	PV-516	16-INCH	PV2	HW	FLG OR VIC	
	PV-517	16-INCH	PV2	HW	FLG OR VIC	
	CAV 1-1	3-INCH	CAV1	NA	THD	3 inch BV1 isolation
	CAV 1-2	3-INCH	CAV1	N/A	THD	3 inch BV1 isolation
	CAV 1-3	3-INCH	CAV1	N/A	THD	3 inch BV1 isolation
	CAV 1-4	3-INCH	CAV1	N/A	THD	3 inch BV1 isolation

VALVE DESIGNATION

HTPSR – Heat Treatment Plant Supernatant Return
 STSR – Sludge Thickener Supernatant Return
 WSL – Waste Sludge
 WSL-CSL – Waste Sludge & Chemical Sludge
 NPW – Non-Potable Water

VALVE TYPES

BV – Ball Valve
 CAV – Combination Air Valve
 KGV – Knife Gate Valve
 PV – Plug Valve

TYPE OF OPERATION

HW – Hand Wheel Operated
 MO – Motor Operated

JOINT CONNECTION

FLG – Flanged
 THD – Threaded
 WAFER – Mount between flanges

Not Guaranteed Complete – Contractor shall provide all valves and actuators as shown on the Drawings and as Specified.

SECTION 15120
PIPING SPECIALTIES

PART 1: GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install complete test, and make ready for operation all piping specialties required by the Work of this Contract. Specific piping and fitting materials, required joining systems and related installation and testing requirements are specified in the respective piping sections. Where duplicity of equipment or requirements are found, those of the specific piping sections shall govern. Piping specialties shall include the following:

1. Unions
2. Flanged Joints
3. Grooved Joints
4. Dielectric Connectors
5. Sleeve Couplings
6. Flanged Adaptors
7. Flexible Connectors
8. Expansion Joints
9. Harnessing and Restraint
10. Vents and Drains
11. Shock Absorbers (Water Hammer Arrestor)
12. Line Strainers
13. Service Saddles
14. Quick Connect Couplings
15. Mechanical Sleeve Seals
16. Appurtenances and Miscellaneous Items

1.02 RELATED WORK

A. Piping penetrations are included in Section 01172.

- B. Pipeline color coding and labeling is included in Section 01340.
- C. Piping materials and systems are included in other Sections of Division 15.
- D. Specialties and apparatus furnished with equipment and systems are included in individual Sections in Division 11.
- E. Valves are included in Section 15100.
- F. Pipe supports are included in Section 15140.
- G. Pipe insulation is included in Section 15250.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, submittals for pipeline specialties and appurtenances as listed below.
- B. Shop Drawings and Product Data
 - 1. Piping layouts with specialties and appurtenances in proposed locations and orientations. Layout submittals shall be oriented by piping system and may be combined with pipe hanger and support submittals, noted below and in Section 15140. The submittals shall include:
 - a. Location of pipe hangers and supports.
 - b. Location and type of backup block or device to prevent joint separation.
 - c. Large scale details of wall penetrations and fabricated fittings.
 - d. Catalog cuts of specialties, joints, couplings, harnesses, expansion joints, gaskets, fasteners and other accessories.
 - 2. Catalog cuts of all pipeline appurtenances specified herein.
 - 3. Brochures and technical data on coatings and linings and proposed method for application and repair.
- C. Samples
- D. Design Data
- E. Test Reports
 - 1. Three copies of certified shop tests showing compliance with appropriate standard.
 - 2. Three copies of all field test reports, signed by Contractor.
- F. Certificates
 - 1. Copies of certification for all welders performing work in accordance with ANSI B31.1.
- G. Manufacturers Installation (or application) instructions.

- H. Statement of Qualifications
- I. Manufacturers Field Report
- J. Project Record Document
- K. Operation and Maintenance Data in accordance with Section 01730.
- L. Warranties

1.04 REFERENCE STANDARDS

A. ASTM International

1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A126 - Standard Specification for Gray Iron Casting for Valves, Flanges and Pipe Fittings.
3. ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts.
4. ASTM A278 - Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 Degrees F.
5. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
6. ASTM A325 - Standard Specification for Strength Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
7. ASTM A536 - Standard Specification for Ductile Iron Castings
8. ASTM A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
9. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
10. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

B. American National Standards Institute (ANSI)

1. ANSI A13.1 - Scheme for the Identification of Piping Systems.
2. ANSI B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form)
3. ANSI B18.2 - Square and Hex Bolts and Screws Inch Series Including Hex Cap Screws and Lag Screws.
4. ANSI B31 - Code for Pressure Piping.
5. ANSI B31.1 - Power Piping

C. American Society of Mechanical Engineers (ASME)

1. ASME B2.1 - Specifications, Dimensions, Gauging for Taper and Straight Pipe Threads (except dry seals).
2. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
3. ASME B16.5 - Pipe Flanges and Flange Fittings

D. American Welding Society (AWS)

1. AWS B3.0 - Welding Procedure and Performance Qualifications

E. American Water Works Association (AWWA)

1. AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3-in Through 48-in (75mm Through 1200mm), for Water and Other Liquids.
2. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
3. AWWA C219 - Bolted Sleeve-Type Couplings for Plain-End Pipe
4. AWWA C606 - Grooved and Shouldered Joints.
5. AWWA Manual M11 - Steel Pipe - A Guide for Design and Installation.

F. Plumbing and Drainage Institute (PDI)

1. WH 201 - Water Hammer Arrestors

G. Underwriters Laboratories (UL)

H. Factory Mutual (FM)

- I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. All materials shall be new and unused.
- B. Install piping to meet requirements of local codes.
- C. Provide manufacturer's certification that materials meet or exceed minimum requirements as specified.
- D. Coordinate dimensions and drilling of flanges with flanges for valves, pumps and other equipment to be installed in piping systems. Bolt holes in flanges to straddle vertical centerline.
- E. Reject materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner and acid solder.

- F. Pipe-joint compound, for pipe carrying flammable or toxic gas, must bear approval of UL or FM.
- G. Unless otherwise specified, pressures referred to in all Piping Sections are expressed in pounds per square inch, gauge above atmospheric pressure, psig and all temperature are expressed in degrees Fahrenheit (F).

1.06 DELIVERY, STORAGE AND HANDLING

- A. During loading, transportation and unloading, take care to prevent damage to components and coatings. Carefully load and unload materials under control at all times. Store materials and equipment off the ground and prevent from freezing as applicable. Cover or cap ends while in storage, until made a part of the work.

1.07 WARRANTY

- A. The Contractor shall obtain from the manufacturer its warranty that the equipment shall be warranted for a period of 1 year from the date of Substantial Completion, as defined in the General Conditions, Division 0 and specified in Section 01740, to be free from defects in workmanship, design or material. If the equipment should fail during the warranty period, the defect shall be corrected and the unit(s) restored to service at no additional cost to the Owner.

PART 2: PRODUCTS

2.01 UNIONS

- A. Unions shall be provided on piping 3 inch and smaller to facilitate dismantling as required by the Drawing mechanical notes.
- B. Unions shall be brass or bronze unions for joining nonferrous pipe; malleable brass or bronze-seated iron or steel unions for joining ferrous pipe; PVC unions for joining PVC pipe; CPVC unions for joining CPVC pipe; stainless steel unions for joining stainless steel pipe.

2.02 FLANGED JOINTS

- A. Flanged Joints shall meet the requirements of the individual piping sections, ASME 16.5 and AWWA Manual M-11. Bolt and nuts shall be Grade B, ASTM A307 unless specified in the respective piping sections, bolt number and size same as flange standard; studs - same quality as machine bolts; 1/8-in thick rubber gaskets with cloth insertions; rust-resistant coatings.

2.03 GROOVED END JOINTS

- A. Split couplings shall be cast in two or more parts and conform to AWWA C606. Couplings shall engage grooved or shouldered pipe ends and encase an elastomeric gasket to create a pipe seal. Gasket material shall be as specified in respective piping sections and recommended by the manufacturer for the service required.
- B. Split couplings shall be as manufactured by Victaulic Company of America or equal. Numbers below refer to Victaulic Co. items, for reference only.
- C. Unless otherwise specified with the individual type of pipe:

1. Flexible split ring couplings shall be:
 - a. grooved ends - Style 77 (for steel/stainless steel) or Style 31 (for grooved ductile iron)
 - b. shouldered ends – Victaulic Style 44 or Fluid Master
 - c. fixed ends – Victaulic Depend-O-Lok, F x F (fixed by fixed)
2. Rigid split ring couplings shall be:
 - a. grooved ends - rigid groove with Style 31 couplings on ductile iron 36-in and smaller diameter with sufficient wall thickness per AWWA C606, or manufacturer's recommendation, or standard groove with Style 07 Zero-Flex coupling on manufactured steel or IPS pipe.

D. Ductile iron pipe for use with split-type coupling joints shall have radius grooved ends conforming to AWWA C606. Pipe shall have grooved ends to provide either a rigid joint or flexible joint as shown on the Drawings and as specified herein. Flexible joint grooving shall permit expansion and contraction, and angular deflection. Rigid joint grooving shall allow no angular or linear movement. Minimum pipe wall thickness for grooved pipe shall be the following class:

<u>Size</u>	<u>Class</u>
4 thru 16	53
18	54
20	55
24	56

- E. Grooved couplings for steel and stainless steel piping shall have roll grooving, machine-grooving, or ring collars fully welded to the pipe or fitting.
- F. Rigid split couplings may be substituted for flanges as noted on the Drawings and in the individual pipe requirements.
- G. Certain minimum thickness of pipe walls are required by AWWA C606 and coupling manufacturers for use of various type split couplings with certain pipes. Utilize at least those minimum wall thicknesses required (unless a greater thickness is specified or required in the individual pipe specifications) with split couplings.
- H. If minimum thicknesses are not utilized with grooving, then a shouldered end treatment with couplings as noted shall be utilized.

2.04 DIELECTRIC CONNECTORS

- A. Dielectric pipe fittings/insulators and unions shall be used to prevent galvanic action wherever valves or piping of dissimilar metals connect. This shall be particularly the case for copper, brass and bronze piping connecting to cast iron or steel piping systems.
- B. Dielectric unions shall be used for 2-in and smaller connections. Steel union nuts shall meet ASTM A575 requirements. The steel or ductile iron connection end shall have a steel body and shall have accurately machined taper tapped pipe threads in accordance with ASME B2.1. The copper connection end shall be a copper solder joint that meets requirements of ASTM B88. Dielectric unions shall be rated for at least 250 psi at 210 degrees F.

- C. Dielectric flange unions shall be used for connections 2-1/2-in and larger. Cast iron flanges shall meet ASTM A126; the copper solder end shall meet ASTM B62 and the pipe thread shall meet ASME B2.1. Dielectric flange unions shall be rated for at least 175 psi at 210 degrees F.

2.05 SLEEVE COUPLINGS

- A. Solid sleeve couplings shall be used to join plain end pipes where shown or required and shall be as specified in AWWA C219.
 - 1. Join welds on ends by couplings without pipe stops. Grind flush to permit slipping coupling in at least one direction to clear pipe joint.
 - 2. Outside diameter and out-of-round tolerances shall be within limits specified by coupling manufacturer.
 - 3. Provide lugs in accordance with ASTM A36. Provide hardened steel washers in accordance with ASTM A325. Plastic plugs shall be fitted in coupling to protect bolt holes. Provide bolts and bolt-studs in accordance with ASTM A307 and ANSI B1.1 with hexagonal or square heads, coarse thread fit, threaded full length with ends chamfered or rounded. Project ends 1/4-in beyond surface of nuts. Hexagonal nuts with dimensions in accordance with ANSI B18.2 and coarse threads in accordance with ANSI B1.1.
 - 4. Middle ring of each mechanical coupling shall have a thickness at least equal to that specified for size of pipe on which coupling is to be used and shall not be less than 10-in long for pipe 30-in and larger and not less than 7-in long for pipe under 30-in in diameter.
 - a. Omit pipe stop from inner surface of middle rings of couplings whenever necessary to permit removal of valves, flowmeters and other installed equipment.
 - b. Provide pipe stops in other couplings.
 - 5. Clean and shop prime with manufacturer's standard rust inhibitive primer.
 - 6. Furnish gaskets of a composition suitable for exposure to the fluid service.
 - 7. Where shown on the Drawings, anchor sleeve-coupled joints with harness bolts. Weld harness lugs to steel pipe.
 - a. Joint harness bolts shall be of sufficient length, with harness lugs placed so that coupling can be slipped at least in one direction to clear joint. Provide harnesses of sufficient number and strength to withstand test pressure as recommended in AWWA M-11.
 - b. Each harness shall have a minimum of two 5/8-in diameter bolts.
 - 8. Unless otherwise specified with the individual type of pipe, mechanical sleeve couplings shall be Smith Blair Style 411; Dresser Style 38, similar models by Baker or equal, with the pipe stop removed.
 - 9. Similar insulation type couplings shall be provided at the face of buildings, between different type metals or where otherwise noted.
 - 10. In addition to those locations noted on the Drawings, sleeve couplings shall be provided on all piping where it connects with a structure or buried directly under a structure at the structure's expansion joints. Special treatment will be required where pipe is encased in

concrete, utilizing minimum 3-in thick Styrofoam placed perpendicular to the horizontal centerline of the coupling.

2.06 FLANGED ADAPTERS

- A. Flanged adaptor connections for grooved or shouldered end pipe shall be VIC-Flange Style 341 (ductile iron pipe and VIC-Flange Style 741/743 (for steel and stainless steel pipe) by the Victaulic Company of America, or equal.
- B. Flanged adaptor connections for plain end pipe at fittings, valves and equipment shall be Dresser Style 127 or 128, equal by Smith Blair.
- C. Restrained flanged adaptors shall be EBAA Iron Series 2100 Mega-Flange, Smith Blair 911/920 or equal.

2.07 FLEXIBLE CONNECTORS

A. Pump and Equipment Flexible Connectors

- 1. The flexible connectors shall be expansion/vibration joints of the single arch type of butyl rubber construction with carcass of high grade woven cotton or suitable synthetic fiber and individual solid steel ring reinforcement. Soft rubber fillers shall be integrally cured into the arches to provide a smooth flow path to prevent settling of material into the arch. Joints shall be constructed to pipeline size and to meet working pressures and corrosive conditions similar to the line where installed. Joints shall have full faced fabric reinforced butyl flanges integral with the body.
- 2. Split steel or ductile iron back-up rings shall be provided to ensure a good joint. Rings shall be designed for mating with ANSI Standard minimum 150 lb flanges. All joints shall be finish coated with asphaltic paint or as required by Section 09902.
- 3. Expansion/vibration joints shall be furnished with control (harness) units. Harness units shall consist of minimum two drilled plates, stretcher bolts, and rubber washers backed by metal washers. The stretcher bolts shall prevent over-elongation of the joint. Extra nuts shall be provided on the stretcher bolts on the inside of the plate to prevent over compression. All nuts, bolts and plates shall be galvanized.
- 4. The manufacturer of the expansion joints shall be a member of the Rubber Expansion Joint Division of the Fluid Sealing Association. Expansion joints shall be Style 1025 filled arch by General Rubber Corp., South Hackensack, NJ or similar products of Mercer Rubber; Goodall Rubber; Garloc; Red Valve Co., Inc.; Proco Products Inc., Stockton, CA or equal.
- 5. In addition to other locations shown on the Drawings, expansion joints shall be utilized in all exposed piping, within 1-ft of a building expansion joint, and on the suction and discharge side of all positive displacement pumps, compressors and rotating machinery, as close to the unit as possible.

B. Flexible Connectors for Seal Water Connections

- 1. Provide one flexible connector for the seal water connection to each pump stuffing box. Connectors shall be of hose of Buna-N or similar resilient material, with braided stainless

steel casing, rated minimum 150 psi with bronze or Type 304 stainless steel NPT end fittings and shall be 12-in in length. Connectors shall be for the purpose of isolating pump vibration from the seal water piping.

2.08 EXPANSION JOINTS

A. Expansion Couplings

1. Bolted split sleeve type couplings to allow for thermal expansion and contraction at the pipe joints shall consist of one piece housing, gasket assembly, bolts and nuts, and end rings to hold the coupling in the proper location.
2. Couplings shall be manufactured from ASTM A240 type 304 or 316 stainless steel material for use on stainless steel pipe. Couplings for use on carbon steel or ductile iron pipe shall be manufactured from ASTM A36 material. Gaskets shall be of a composition suitable for exposure to the fluid or air service.
3. Carbon steel couplings shall be coated in accordance with liquid epoxy coating per AWWA C210 or fusion bonded epoxy coating per AWWA C213. Manufacturers standard shop primer will not be accepted as a coating system. Stainless steel couplings shall be passivated after all welding is completed.
4. End rings of the same material as the coupling housing shall be welded to the plain end of the pipe ends that form the joint per the coupling manufacturer's recommendations to hold the coupling in the proper location.
5. The expansion joints shall be designed for the axial movements shown on the Drawings along with the maximum axial force required to compress the joint. The joints shall prevent axial, lateral and rotational movement and vibration from being transmitted to the piping and equipment and shall be suitable for 50 psig operating pressure unless otherwise indicated.
6. Expansion couplings for expansion joints for plain end pipe shall be Victaulic type VBSP Style 231, or equal.

B. Single- and Multiple-Arch Type

1. The expansion joints shall be of the rubber spool type, soft rubber filled with single-, double-, or triple-arch steel reinforced expansion joint, as indicated on the Drawings, suitable for 120 degrees F service, unless otherwise indicated.
2. The rubber used shall be suited for service with wastewater and/or wastewater sludge, including three-ply abrasion resistant liner.
3. Provide galvanized retaining rings to mate with adjacent pipe flanges.
4. The expansion joints shall be designed for the axial movements shown on the Drawings along with the maximum axial force required to compress the joint. The joints shall prevent axial, lateral and rotational movement and vibration from being transmitted to the piping and equipment and shall be suitable for 50 psig operating pressure unless otherwise indicated.

5. Provide guides for each expansion joint.
6. Expansion joints shall be as manufactured by Proco, General rubber or equal.

C. Flexible Metal Hose

1. Flexible metal hose shall be constructed of corrugated inner tubing of tin-bronze or Type 321 stainless steel and shall have an outer shield of wire-braid of either tin-bronze or Type 321 stainless steel.
2. The flexible hose connectors shall have a length not less than five times the nominal pipe diameter.
3. The connectors shall have 150 psi flanged ends in all sizes and shall be suitable for pressure up to 150 psig and temperatures to 400 degrees F.
4. Flexible hose connectors shall be manufactured by Senior Flexonics; Metraflex or equal.

2.09 HARNESSING AND RESTRAINT DEVICES

- A. Where harnessed couplings or adapters are noted, they shall conform to AWWA Manual M11 except as modified by the Drawings or this Section.
- B. Unless otherwise noted, size and material for tie rods, clamps, plates and hex nuts shall be as shown on the Drawings, or, if not shown on the Drawings, shall be as required in AWWA Manual M11. Manufactured restraining clamp assemblies shall be as manufactured by Smith Blair, EBAA Iron or equal.
- C. Restrained flange adapters shall be EBAA Iron Megalug 2100, Smith Blair Style 911 or 920.
- D. The Contractor shall be responsible for anchorage including restraint as noted elsewhere in Division 15.

2.10 VENTS AND DRAINS

- A. 1-in vents shall be provided at the high point in each system. Vent connections may be tapped, provided the tap will accept three full threads on the bronze nipple.
- B. 1-1/2-in drains shall be provided to permit drainage of each system located on the invert of the blind flange; provide hose-end valve.

2.11 SHOCK ABSORBERS (WATER HAMMER ARRESTORS)

- A. Shock absorbers shall be supplied on the nonpotable and potable water piping. The shock absorbers shall be as manufactured by Josam Manufacturing Company, Michigan City, IN; similar model by J.R. Smith or Zurn Industries.
- B. Arrestors shall be sized in accordance with PDI WH 201, for all hot and cold water systems.
- C. Placement shall be in accordance with PDI WH 201 with a minimum of one shock absorber at each quick acting valve, lever operated valve, self closing valve and self closing valve/faucet; or

a minimum of one for each battery of these fixtures. The water hammer arrestors shall be accessible for maintenance.

2.12 LINE STRAINERS

A. "Y" Type Strainers

1. Manual strainers furnished for pipe diameters smaller than 2-in shall be "Y" type, capable of removing solids 0.01-in in diameter and larger. The strainer body shall be of forged steel construction for steel pipe and brass or bronze for copper pipe and shall conform to the latest revision of ASTM A278, Class 30. Strainer elements, including woven wire mesh, shall be constructed of 316 stainless steel.
2. The design of the strainer body shall be such that the cleanout plug and screen may be easily removed to permit inspection and cleaning without disassembly of the inlet and outlet piping. End connections shall be ANSI screwed pipe threads.
3. Sufficient spare screen shall be furnished for replacement of all "Y" type units at least once. The strainers shall be designed for a maximum operating pressure of 150 psig. They shall be as manufactured by Mueller, Tyco, Conaco, Jenkins or equal.

B. Manual Basket Strainer

1. Manual basket strainers shall be furnished for pipe diameters 2-in in diameter and larger, as shown on the Drawings. The strainer body shall be of cast iron construction. The strainer elements, including woven wire screen, shall be constructed of Type 304 stainless steel. The design of the basket strainer body shall be such that the bolted lid and basket may be easily removed for inspection and cleaning without disassembly of the inlet and outlet piping.
2. A trap with a blow-off port shall be provided for removing any material that may settle at the bottom. The strainers shall be designed for a minimum operating pressure of 150 psig, and shall be Mueller Style 125 or equal.
3. Proper blowoff piping with valve shall be supplied and run to nearest drain.

2.13 SERVICE SADDLES

- A. Service saddles for outlet sizes up to 2-1/2 in shall have high density fusion bonded epoxy coated ductile iron bodies, which extend at least 160 degrees around the circumference of the pipe to be tapped and shall have NBR, Buna-N gaskets bonded into the cavity for internal and external retention. Working pressure of the service saddle shall be at least 250 psi hydrostatic. Saddles shall be of the double bale design of 14 gauge stainless steel straps that are passivated for corrosion resistance. Washers shall be stainless steel passivated for corrosion resistance. Service saddles shall be Smith-Blair Style 313/317, JCM 406 by JCM Industries or equal.

2.14 TAPPING SLEEVES

- A. Tapping sleeves shall be fabricated 304 stainless steel, with a pass through bolt design and provide 360 degree seal around the pipe. Sleeves shall be fully passivated. For outlet sizes up to 8-inch the outlet half of the body shall be not less than 12 gauge thickness. The conforming half shall be not less than 14 gauge thickness. The neck shall be 10 gage SS with a CF8 cast stainless flange. Flange outlets shall be indexed per MSS-SP60 to accept a tapping valve. Lugs shall have a pass through bolt design and allow tightening from either side of the pipe. Bolts shall not be integrally welded to the sleeve. Bolting lug shall be triangular design with a maximum of 3-inch bolt center spacing. Bolting hardware shall be 316 stainless steel. Bolts shall be track head type, burnished with permanently lubricated heavy hex nuts and stainless washers. Gasket shall be full circumferential design, molded of EPDM. Gasket surface shall be gridded minimum ¼-inch thick with 304 stainless steel bridge plates molded flush into the gasket and have a raised hydro mechanical outlet seal for surge and water hammer resistance. Sleeves shall be rated for 175 psi working pressure, per ANSI/AWWA C207. Tapping Sleeves shall be JCM 432 or approved equal.

2.15 QUICK CONNECT COUPLINGS

- A. Quick Connect Couplings shall be of the cam and groove type consisting of a male adapter and/or a female coupler conforming to Specification A-A-59326. Male adapters shall be designed to receive a female coupler without requiring threading, bolting, or tools. Connections shall remain tight and leakproof under pressures up to 200 psig. Each male adapter shall be furnished with a dust cap complete with a 18-in long security chain of 316 stainless steel.
 - 1. Male adapters and female couplings shall be furnished in accordance with the Drawings, or as required by the installation.
 - 2. Couplings shall be 316 stainless steel body, 300 series stainless steel cams and hardware, EPDM gaskets. Couplings and adaptors for sulfuric acid and sodium hypochlorite service shall be Carpenter 20 steel alloy body, 316 stainless steel cams and hardware, Viton A gaskets.
 - 3. Couplings shall be as manufactured by OPW Engineered Systems, Ever-Tite, Dixon, PT Coupling Co.
- B. Dry Disconnect Couplings shall be provided where indicated on the Drawings. Male component shall be mounted to stationary pipe. Female component with valve actuator shall be Mounted to fill hose. OWNER shall provide female component to tank truck driver.
 - 1. Couplings shall be Autolok and Kamvalok by OPW Engineered systems, Cam & Groove and Maxi-Dry by PT Coupling Company, or equal by Ever-Tite.

2.16 MECHANICAL SLEEVE SEALS

- A. Mechanical sleeve seals shall be used to secure and seal the annular space around all new sleeved and core-drilled wall penetrations.
- B. A single seal shall be provided for all sleeve and cores in walls up to 14-in thick; dual sleeves shall be provided in larger walls, and where shown on the Drawing mechanical details.

- C. Galvanized steel, stainless steel, or HDPE wall sleeves and concrete core diameter shall be sized to accommodate the modular elements, per the manufacturer's recommendations.
- D. For dry areas, bolts and hardware shall be carbon steel, zinc-plated. Pressure plates shall be corrosion-resistant acetal resin. For submerged or wet areas, hardware shall be 316 stainless steel.
- E. Fire rated assemblies shall be installed in fire rated walls and floors.
- F. Mechanical sleeve seals shall consist of modular bolted, synthetic rubber sealing elements, Link Seal by Thunderline Corp. or equal. The elastomer material shall be compatible with the service requirement.

2.17 APPURTENANCES AND MISCELLANEOUS ITEMS

- A. All gaskets, glands, bolts, nuts and other required hardware shall be provided for connection of piping and appurtenances. Bolts and nuts shall be high strength, Type 316 stainless steel if submerged, buried, or subject to splashing and cadmium plated otherwise, with tee-head and hexagon nut. All other hardware shall be of the size, type and number as required and recommended by the piping or appurtenance manufacturer and as specified herein.
- B. All gaskets for flanges shall be full face and suitable for 200 degrees F operating temperature, and the fluids carried. See also Division 1.
- C. Plugs, caps and similar accessories shall be of the same material as the pipe and of the locking type, unless otherwise noted.
- D. Unions shall be of the same material as the pipe, except for dielectric connections.

PART 3: EXECUTION

3.01 GENERAL

- A. All dirt, scale, weld splatter, water and other foreign matter shall be removed from the inside and outside of all pipe and sub-assemblies prior to installing.
- B. All pipe joints and connections to equipment shall be made in such a manner as to produce a minimum of strain at the joint.
- C. Test Connections
 - 1. Provide 1/2-in female NPT test connection equipped with 1/2-in brass plug on all pump suction and discharge lines. Where indicated on the Drawings, test connections should be equipped with bar stock valve and gauge. Provide test connections at all steam traps. The connection shall be located on the discharge side of the trap between the trap and the first valve. It shall consist of a 1/2-in branch connection terminated with a gate valve.
- D. Installation of Expansion Joints and Flexible Connectors
 - 1. Piping systems shall be aligned prior to installation of expansion fittings. Alignment shall be provided by fitting a rigid pipe spool in place of the expansion joint. Prior to testing of

the piping system, the pipe spool shall be replaced with the specified expansion or flexible fitting.

2. In addition to the locations noted on the Drawings and in PART 2, expansion fittings and anchors shall be located and spaced as specified by the Expansion Joint Manufacturer's Association. The expansion joints/flexible connectors shall not be installed during times of temperature extreme or in a fully compressed or fully expanded condition.

E. Installation of Sleeve Couplings

1. Unless otherwise required by the manufacturer's instructions, prior to installation of sleeve couplings, the pipe ends shall be cleaned thoroughly for a distance of at least 12-in. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6-in from the end, the middle ring shall be placed on the already installed pipe and shall be inserted into the middle ring flair and brought to proper position in relation to the pipe already installed. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares.
2. After the bolts have been inserted and all nuts have been made up fingertight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.
3. The correct torque as indicated by a torque wrench shall not exceed 75 ft-lb for 5/8-in bolts and 90 ft-lb for 3/4-in bolts.
4. If a wrench other than a torque wrench is used, it should be no longer than 12-in so that when used by the average person the above torque values shall not be exceeded.
5. To prevent sleeve couplings from pulling apart under pressure, a suitable harnessing or flange clamp assembly shall be provided and installed where shown on the Drawings, directed by the Engineer or required elsewhere under Division 15 concerning anchorage.
6. Note the additional locations required for sleeve couplings in PART 2. Also note Contractor's responsibility for locating, providing and installing restraints.

F. Installation of Split Couplings

1. Prior to assembly of split couplings, grooves or shoulders of the pipe as well as other parts shall be thoroughly cleaned. The ends of the pipes and outside of the gaskets shall be moderately coated with manufacturer's recommended lubricant, petroleum jelly, cup grease, soft soap, or graphite paste and the gasket shall be slipped over one pipe end. Lubricant shall be compatible with potable water application. After the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. The housing sections then shall be placed.
2. Ensure that the joints are fully extended after the rings are in place and prior to tightening the bolts. After the bolts have been inserted, the nuts shall be tightened until the housing sections are firmly in contact, as required by the manufacturer, without excessive bolt tension or strain on the pipe.

G. Installation of Pipeline Appurtenances

1. All pipeline appurtenances shall be installed as required and in accordance with the manufacturer's recommendations, as acceptable to the Engineer.
2. Gauges, meters and similar in-line items shall be isolated from testing pressures in excess of the rated pressure of the assembly.
3. Use Teflon tape on all screwed fittings.

H. Installation of Unions

1. Use unions to allow dismantling of pipe, valves, and equipment.

I. Welding

1. Welding shall be in accordance with ANSI B31 and AWS B3.0.
2. Install welding fittings on all welded lines. Make changes in direction and intersection of lines with welding fittings. Do not miter pipes to form elbows or notch straight runs to form tees, or any similar construction. Do not employ welder who has not been fully qualified in above specified procedure and so certified by approved welding bureau or similar locally recognized testing authority.

J. Installation of Flanged Joints

1. Make flanged joints with bolts; bolt studs with nut on each end; or studs with nuts where one flange is tapped. Use number and size of bolts conforming to same ANSI Standard as flanges. Before flanges pieces are assembled, remove rust resistant coating from machined surfaces, clean gaskets and smooth all burrs and other defects. Make up flanged joints tight, care being taken to prevent undue strain upon valves or other pieces of equipment.

3.02 TESTING

- A. Test all pipelines for water/gas tightness as specified in the Piping or System Sections. Furnish all labor, testing plugs or caps, pressure pumps, pipe connections, gauges and all other equipment required. Testing shall be performed in accordance with one or more of the testing procedures appended to this Section as specified in each Piping or System Section. All testing shall be performed in the presence of the Engineer.
- B. Repair faulty joints or remove defective pipe and fittings and replace as approved by the Engineer. Retest.

End of Section

SECTION 15140
PIPE HANGERS AND SUPPORTS

PART 1: GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals and install a complete system of pipe hangers, supports, concrete inserts and anchor bolts including all metallic hanging and supporting devices for supporting non-buried piping as shown on the Drawings and as specified herein.
- B. The absence of pipe supports and details on the Drawings shall not relieve the Contractor of the responsibility for providing them. Pipe supports indicated on the Drawings are shown only to convey the intent of the design for a particular location and are not intended to represent a complete system. The complete pipe support system shall be designed by a qualified professional engineer licensed in the State of New Jersey. The professional engineer shall have at least five years experience in the field of pipe support design and manufacturing.
- C. No structural drawings shall be issued. All supports shall be designed at the job site using existing field conditions at no additional cost to the Owner.
- D. Use of existing supports shall be permitted. The qualified professional engineer designing the support system shall review the existing conditions and shall submit a report certifying the adequacy of the existing support system to carry the imposed load from the new support.

1.02 RELATED WORK

- A. Pipe and fittings are included in respective Sections of Division 15.
- B. Valves are included in Section 15100.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, complete sets of shop drawings of all items to be furnished under this Section. Submittals shall include complete layouts, schedules, location plans and shop drawings with complete total bill of materials for all pipe support systems at new piping and equipment shown of the drawings.
- B. Submittals shall include a representative catalog cut for each different type of pipe hanger or support indicating the materials of construction, important dimensions and range of pipe sizes for which that hanger is suitable. Where standard hangers and/or supports are not suitable, submit detailed drawings showing materials and details of construction for each type of special hanger and/or support. Provide detailed information on anti-seize compound.
- C. Submittals shall include complete piping drawings as submitted for each piping submittal indicating type of hanger and/or support, location, magnitude of load transmitted to the structure and type of anchor, guide and other pipe supporting appurtenances including structural fasteners.

- D. Types and locations of pipe hangers and/or supports shall also be shown on the piping layouts for each piping submittal as specified in the respective Division 15 pipe sections. Service conditions for each piping system, including service temperatures, and operating and test pressures, are tabulated in the piping sections.
- E. Design calculations of pipe hangers and support system shall be performed by the Contractor. All equations used in the design and all parameters and assumptions used in the equations shall be identified including their units of measurements. All design documents and design calculations shall be signed and sealed by a professional engineer registered in the State of New Jersey.
- F. Contractor shall submit with design calculations: (1) shop drawings of standard catalog items with load rating per MSS-SP-58 Standard by the support manufacturer for Engineer's review; (2) professional engineer certified calculations in accordance with MSS-SP-58 Standard for all other hanger components which are not included in the catalog items for Engineer's review; and (3) professional engineer certified calculations in accordance with AISC Manual for all supplementary steels for Engineers review.
- G. Contractor shall submit 8 ½ x 11-inch individual support design detail drawings, which shall include complete bill of materials and loads for Engineer's review. Larger shop drawings (i.e. 30-inch by 42-inch) showing pipe support locations are acceptable and shall reference typical pipe support details for these locations as described in 1.03.B above.

1.04 REFERENCE STANDARDS

- A. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)
 - 1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture.
 - 2. MSS SP-69 - Pipe Hangers and Supports - Selection and Application.
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM A36 - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- C. American National Standards Institute (ANSI)
 - 1. ANSI B31.1 - Power Piping.
- G. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. All hangers, supports and appurtenances shall conform to the latest applicable requirements of ANSI B31.1, except as supplemented or modified by the requirements of this Section.
- B. All hangers, supports and appurtenances shall be of approved standard design where possible and shall be adequate to maintain the supported load in proper position under all operating conditions. The minimum working factor of safety for all supporting equipment, with the exception of springs, shall be five times the ultimate tensile strength of the material, assuming 10-ft of waterfilled pipe being supported.
- C. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, submit certification stating that such requirements have been complied with.

1.06 DELIVERY, STORAGE AND HANDLING

- A. All supports and hangers shall be crated, delivered and uncrated so as to protect against any damage.
- B. All parts shall be properly protected so that no damage or deterioration shall occur during a prolonged delay from the time of shipment until installation is completed.
- C. Finished metal surfaces not galvanized, that are not of stainless steel construction, or that are not coated, shall be grease coated, to prevent rust and corrosion.

PART 2: PRODUCTS

2.01 GENERAL

- A. All of the equipment specified herein is intended to support the various types of pipe and piping systems shown on the Drawings. It shall be the responsibility of the Contractor to develop final details and any details associated with special conditions not already covered to meet the system conditions specified in the Division 15 Pipe Sections. Refer to the following for additional pipe hanger and support design requirements:
 - a. All supports shall be located on an approved piping drawing and this support location drawing shall be submitted for Engineer's review.
 - b. Provide pipe alignment guides (or pipe supports that provides the same function) at all expansion joints and loops per expansion joint manufacturer's recommendation.
 - c. Provide intermediate guides per good design practice. Preferably each fourth support shall be a guide.
- B. All pipe and tubing shall be supported as required to prevent significant stresses in the pipe or tubing material, valves, fittings and other pipe appurtenances and to support and secure the pipe in the intended position and alignment. All supports shall be designed to adequately secure the pipe against excessive dislocation due to thermal expansion and contraction, internal flow forces and all probable external forces such as equipment, pipe and personnel contact. Any structural

steel members required to brace any piping from excessive dislocation shall be provided by the Contractor at no additional expense to the Owner.

- C. The Contractor may propose minor adjustments to the piping arrangements in order to simplify the supports, or in order to resolve minor conflicts in the work.
- D. Where flexible couplings are required at equipment, tanks, etc, the end opposite to the piece of equipment, tank, etc, shall be rigidly supported, to prevent transfer of system force to the equipment. No fixed or restraining supports shall be installed between a flexible coupling and the piece of equipment.
- E. All pipe and appurtenances connected to the equipment shall be supported in a manner to prevent any strain from being imposed on the equipment or piping system.
- F. All rods, clamps, hangers, inserts, anchor bolts, brackets and components for interior and exterior pipe supports shall be furnished with galvanized finish, hot dipped or electro-galvanized coated, except where field welding is required, where cold-applied galvanizing may be used. Unless otherwise specified, all pipe support materials shall be hot-dipped galvanized and all threaded item will be electro-galvanized. All stainless steel piping shall be isolated from all ferrous materials, including galvanized steel (to prevent galvanic corrosion) by wrapping stainless steel pipe with 1/16-inch thick neoprene pad and using two 180-degree galvanized insulation protection shields. Stainless steel straps shall be used, if Engineer deems necessary, to keep shields in place.
- G. Supports shall be sufficiently close together such that the sag of the pipe is within limits that will permit drainage and avoid excessive bending stresses from concentrated loads between supports.
- H. Where pipe hangers and supports come in contact with copper piping provide protection from galvanic corrosion by; wrapping pipe with 1/16-in thick neoprene sheet material and galvanized protection shield; isolators similar to Elcen Figure Number 228; or copper plated or 1/16-in thick PVC coated hangers and supports.
- I. Pipe supports shall be provided as follows:
 - 1. Systems of ductile iron piping, valves and appurtenances shall be provided with adequate support as deemed acceptable by the Engineer.
 - 2. All vertical pipes shall be supported at each floor or at intervals of not more than 12-ft by approved pipe collars, clamps, brackets, or wall rests and at all points necessary to insure rigid construction. All vertical pipes passing through pipe sleeves shall be secured using a pipe collar.
 - 3. Pipe supports shall not induce point loadings but shall distribute pipe loads evenly along the pipe circumference.
 - 4. Supports shall be provided at changes in direction and elsewhere as shown in the Drawings or as specified herein. No piping shall be supported from other piping or from metal stairs, ladders and walkways, unless specifically directed or authorized by the Engineer.

5. Pipe supports shall be provided to minimize lateral forces through valves, both sides of split type couplings and sleeve type couplings and to minimize all pipe forces on pump housings. Pump housings shall not be utilized to support connecting pipes.
 6. Effects of thermal expansion and contraction of the pipe shall be accounted for in the pipe support selection and installation.
- J. Unless otherwise specified herein, pipe hangers and supports shall be standard catalogued components, conforming to the requirements of MSS-SP-58 and -69; and shall be as manufactured by Anvil International (formerly Grinnell Co., Inc.), Providence, RI; Carpenter & Patterson, Inc., Woburn, MA; and Unistrut Northeast, Cambridge, MA, or equal. Any reference to a specific figure number of a specific manufacturer is for the purpose of establishing a type and quality of product and shall not be considered as proprietary.
- K. Any required pipe supports for which the supports specified in this Section are not applicable shall be fabricated or constructed from standard structural steel shapes, concrete and anchor hardware similar to items previously specified herein and shall be subject to the approval of the Engineer.
- L. Expansion anchors shall be equal to Kwik-Bolt as manufactured by the McCulloch Industries, Minneapolis, MI or Wej-it manufactured by Wej-it Expansion Products, Inc., Bloomfield, CO, or equal. The length of expansion bolts shall be sufficient to place the wedge portion of the bolt a minimum of 1-in behind the steel reinforcement.
- M. Hanger rods shall be hot rolled steel, machine threaded and galvanized after fabrication. The strength of the rod shall be based on its root diameter. Beam clamps, C clamps or welded beam attachments shall be used for attaching hanger rods to structural steel members. Use existing strip inserts as much as possible. Where necessary and approved by the Engineer, expansion anchors shall be used for attaching to concrete structures.

2.02 SINGLE PIPE HANGERS

- A. Single pipes shall be supported by hangers suspended by hanger rods from structural steel members, concrete ceilings, bottom of trapeze hangers and wall mounted steel angle brackets.
- B. Except as otherwise specified herein, pipe hangers shall be galvanized steel, of the adjustable clevis type similar to Grinnell Figure Numbers 65, 260 and 590 as required, or equal.
- C. Where pipes are near walls, beams, columns, etc, and located an excessive distance from ceilings or underside of beams, welded steel wall brackets similar to Carpenter and Patterson Figure numbers 69-68, 84 or 139 or equal shall be used for hanging pipe. Where single pipes rest on top of bracket pipe supports, attachments shall meet requirements as specified under multiple pipe hangers.

2.03 SINGLE AND MULTIPLE PIPE SUPPORTS

- A. Pipes 3-in in diameter and larger shall be supported by adjustable stanchions similar to F&S Figure 427 or equal. Stanchions shall provide at least 4-in adjustment and be flange mounted to floor.
- B. Pipes less than 3-in in diameter shall be held in position by supports fabricated from steel "C" channel, welded post base similar to Unistrut Figure P2072A or equal and pipe clamps similar to Unistrut Figures P1109 thru P1126 or equal. Where required to assure adequate support, fabricate supports using two vertical members and post bases connected together by horizontal member of sufficient load capacity to support pipe. Wherever possible supports shall be fastened to nearby walls or other structural member to provide horizontal rigidity. More than one pipe may be supported from a common fabricated support.
- C. Where shown on the Drawings, pipe shall be supported using concrete anchor posts. Pipe shall be securely fastened to the posts using suitable metal straps as required and as approved. A felt insert shall be used to isolate the piping from the poured concrete.

2.04 WALL SUPPORTED PIPES

- A. Single or multiple pipes located adjacent to walls, columns or other structural members, whenever deemed necessary, shall be supported using welded galvanized steel wall brackets similar to Carpenter and Patterson Figure Numbers 69-78, 84, or 134 or equal; or "C" channel with galvanized steel brackets similar to Unistrut pipe clamps or equal. All members shall be securely fastened to wall, column, etc, using double expansion shields or other method as approved by the Engineer. Additional wall bearing plates shall be provided where required.
- B. Pipe shall be attached to supports using methods specified herein to meet the intent of this Section.

2.05 BASE ANCHOR SUPPORT

- A. Where pipes change direction from horizontal to vertical via a bend, a welded or cast base bend support shall be installed at the bend to carry the load. The base bend shall be fastened to the floor, pipe stanchion, or concrete pedestal using expansion anchors or other method as approved by the Engineer.

2.06 VERTICAL PIPE SUPPORTS

- A. Where vertical pipes are not supported by a Unistrut system as specified in Paragraph 2.07 below, they shall be supported in one of the following methods.
 - 1. For pipes 1/4-in to 2-in in diameter, an extension hanger ring shall be provided with an extension rod and hanger flange. The rod diameter shall be as recommended by the manufacturer for the type of pipe to be supported. The hanger ring shall be steel or PVC clad depending on the supported pipe. The hanger ring shall be equal to Carpenter & Paterson Fig. No. 81 or 81CT or equal. The anchor flange shall be galvanized malleable iron similar to Carpenter and Patterson Figure No. 85 or equal.

2. For pipes equal to or greater than 2-in in diameter extended pipe clamps similar to Carpenter and Patterson Figure No. 267 or equal may be used. The hanger shall be attached to concrete structures using concrete anchors, or to steel support members using welding lugs similar to Carpenter and Patterson Figure No. 220 or equal.
3. Pipe riser clamps shall be used to support all vertical pipes extending through floor slabs. Riser clamps shall be galvanized steel similar to Carpenter and Patterson Figure No. 126 or equal. Copper clad or PVC coated clamps shall be used on copper pipes. Insulation shall be removed from insulated pipes prior to installing riser clamps. Insulation shall not be damaged by clamp installation.
4. Unless otherwise specified, shown, or specifically approved by the Engineer, vertical runs exceeding 12-ft shall be supported by base elbows/tees, clamps, brackets, wall rests and pipe collars, all located as required to ensure a rigid installation.

2.07 SPECIAL SUPPORTS

- A. Pipe supports shall be provided for closely spaced vertical piping systems required to provide a rigid installation. The interval of vertical support spacing shall be as specified, but in no case shall vertical interval exceed 10-ft. The support system shall consist of a framework suitably anchored to floors, ceilings or roofs.
- B. Vertical and horizontal supporting members shall be U shaped channels similar to Unistrut Series P1000. Vertical piping shall be secured to the horizontal members by pipe clamps or pipe straps. All components shall be of galvanized steel.
- C. For piping 3-in and smaller, the framework shall be as manufactured by the Unistrut Corporation; Globe-Strut as manufactured by the Metal Products Division of U.S. Gypsum or equal. For piping larger than 3-in, the support frame shall be fabricated from structural steel shapes and secured through the use of expansion anchors.
- D. The assemblies shall be furnished complete with all nuts, bolts and fittings required for a complete assembly including end caps for all unistruts members.
- E. The design of each individual framing system shall be the responsibility of the Contractor. Shop drawings, as specified above shall be submitted and shall show all details of the installation, including dimensions and types of supports. In all instances the completed frame shall be adequately braced to provide a complete rigid structure when all the piping has been attached.
- F. Supports not otherwise described in this Section shall be fabricated or constructed from standard structural steel shapes or unistrut-type frame; have anchor hardware similar to items previously specified herein, shall meet the minimum requirements listed below and be subject to the approval of the Engineer.
 1. Pipe support systems shall meet all requirements of this Section and all related Sections.

2. Complete design details of the pipe support system and system components shall be submitted for review and approval as specified in PART 1. No hanger or support shall be installed without the written approval of the Engineer.
3. The pipe support system shall not impose loads on the supporting structures in excess of the loads for which the supporting structure is designed.

2.08 SURFACE PREPARATION AND SHOP PRIME PAINTING

- A. All ferrous surfaces shall be prepared and shop painted as part of the work of this Section. Surface preparation and shop painting shall be as specified in Section 09902.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Proceed with the installation of piping and supports only after any building structural work has been completed and new concrete has reached its 28-day compressive strength.
- B. The installed systems shall not interfere with maintenance and operational access to any equipment installed under this Section, or any other related Section.
- C. All pipes, horizontal and vertical, requiring rigid support shall be supported from the building structure by approved methods. Supports shall be provided at changes in direction and elsewhere as shown in the Drawings or as specified herein. No piping shall be supported from metal stairs, ladders and walkways unless specifically directed or authorized by the Engineer.
- D. All pipe supports shall be designed with liberal strength and stiffness to support the respective pipes under the maximum combination of peak loading conditions to include pipe weight, liquid weight, liquid movement and pressure forces, thermal expansion and contraction, vibrations and all probable externally applied forces. Prior to installation, all pipe supports shall be approved by the Engineer.
- E. Pipe supports shall be provided to minimize lateral forces through valves, both sides of split type couplings and sleeve type couplings (within four pipe diameters) and to minimize all pipe forces on pump housings. Pump housings shall not be utilized to support connecting pipes.
- F. Apply anti-seize compound to all nuts and bolts. Supports installed without the approved compound shall be dismantled and correctly installed, at no cost to the Owner.

3.02 TESTING

- A. All pipe support systems shall be tested for compliance with this Section. After installation, each pipe support system shall be tested in conjunction with the respective piping pressure tests. If any part of the pipe support system proves to be defective or inadequate, it shall be repaired or augmented under this Section to the satisfaction of the Engineer.

END OF SECTION

SECTION 16020
ELECTRICAL

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials and equipment required to install complete and make operational, electrical and process instrumentation systems as specified, as shown on the Drawings.
- B. The work shall include furnishing and installing the following:
 - 1. Conduit, wire and field connections for all motors, motor controllers, control devices, control panels and electrical equipment furnished under other Divisions of these Specifications.
 - 2. Conduit, wiring and terminations for all field-mounted instruments furnished and mounted under other Divisions of these Specifications, including process instrumentation primary elements, transmitters, local indicators and control panels. Lightning and surge protection equipment wiring at process instrumentation transmitters. Install vendor furnished cables specified under other Divisions of these Specifications.
 - 3. Conduit, wiring and terminations for variable frequency drives, harmonic filters, and transformers furnished and mounted under other Divisions of these Specifications.
 - 4. Coordination is required between the contractor and the VFD manufacturer to provide a qualified technician to re-program the drives as necessary, re-configure the drives to accommodate the new WAS pumps, perform startup and provide training to the staff. A new VFD I/O card will need to be provided by the VFD manufacturer to accommodate all the required inputs and outputs.
 - 5. Grounding System
- C. Each bidder or their authorized representatives shall, before preparing their proposal, visit all areas of the existing buildings and structures in which work under this bid is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that they have visited the site, buildings and structures and noted the locations and conditions under which the work will be performed and that they takes full responsibility for a complete knowledge of all factors governing his/her work.

1.02 RELATED WORK

- A. Refer to the Process floor plans for room and building dimensions.
- B. Refer to Process Mechanical Drawings for the exact location of mechanical, instrumentation and process equipment.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings for equipment, materials and other items furnished under Division 16.
- B. Check shop drawings for accuracy and contract requirements prior to submittal. Shop drawings shall be stamped with the date checked and a statement indicating that the shop drawings conform to Specifications and Drawings. This statement shall also list all exceptions to the Specifications and Drawings. Shop drawings not so checked and noted shall be returned.
- C. The Engineer's check shall be for conformance with the design concept of the project and compliance with the Specifications and Drawings. Errors and omissions on approved shop drawings shall not relieve the Contractor from the responsibility of providing materials and workmanship required by the Specifications and Drawings.
- D. All dimensions shall be field verified at the job site and coordinated with the work of all other trades.
- E. Material shall not be ordered or shipped until the shop drawings have been approved. No material shall be ordered or shop work started if shop drawings are marked "APPROVED AS NOTED - CONFIRM," "APPROVED AS NOTED - RESUBMIT" or "NOT APPROVED."
- F. Operation and Maintenance Data
 - 1. Submit operations and maintenance data for equipment furnished under this Division, in accordance with Section 01730. The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists, etc., to instruct operating and maintenance personnel unfamiliar with such equipment.

1.04 CONTRACT PERFORMANCE REQUIREMENTS

- A. Electric equipment, materials and installation shall comply with the latest edition of the National Electrical Code (NEC) and with the latest edition of the following codes and standards:
 - 1. National Electrical Safety Code (NESC)
 - 2. Occupational Safety and Health Administration (OSHA)
 - 3. National Fire Protection Association (NFPA)
 - 4. National Electrical Manufacturers Association (NEMA)
 - 5. American National Standards Institute (ANSI)
 - 6. Insulated Cable Engineers Association (ICEA)
 - 7. Instrument Society of America (ISA)
 - 8. Underwriters Laboratories (UL)

9. Factory Mutual (FM)

10. National Electrical Testing Association (NETA)

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 PRIORITY OF THE CONTRACT DOCUMENTS

- A. If, during the performance of the work, the Contractor finds a conflict, error or discrepancy between or among one or more of the Sections or between or among one or more Sections and the Drawings, furnish the higher performance requirements. The higher performance requirement shall be considered the equipment, material, device or installation method which represents the most stringent option, the highest quality or the largest quantity.
- B. In all cases, figured dimensions shall govern over scaled dimensions, but work not dimensioned shall be as directed by the Engineer and work not particularly shown, identified, sized, or located shall be the same as similar work that is shown or specified.
- C. Detailed Drawings shall govern over general drawings, larger scale Drawings take precedence over smaller scale Drawings, Change Order Drawings shall govern over Contract Drawings and Contract Drawings shall govern over Shop Drawings.
- D. If the issue of priority is due to a conflict or discrepancy between the provisions of the Contract Documents and any referenced standard, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence if they are more stringent or presumptively cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, or codes of any technical society, organization or association, or between Laws and Regulations, the higher performance requirement shall be binding on the Contractor, unless otherwise directed by the Engineer.
- E. In accordance with the intent of the Contract Documents, the Contractor accepts the fact that compliance with the priority order specified shall not justify an increase in Contract Price or an extension in Contract Time nor limit in any way, the Contractor's responsibility to comply with all Laws and Regulations at all times

1.06 WORKING (INSTALLATION) DRAWINGS

- A. Prints of working (installation) drawings shall be submitted to the Engineer for review, in quantities as specified.
- B. The Contract Drawings are not intended to serve as working or installation drawings, but are for engineering and general arrangement purposes only. The Contractor shall prepare his own working (installation) drawings based on the Contract Drawings, but showing all details of construction, such as dimensioned equipment and conduit layouts, lighting layouts, interconnection wiring diagrams and similar drawings depicting the construction and installation work to be performed. Such drawings shall show all conduit and electrical equipment supports, hangers, foundations, conduit and cable schedules, lighting fixture layouts and circuiting, lighting, power, control instrumentation, and signal wiring complete.

- C. The working drawings shall be prepared based on certified manufacturer's shop drawings of equipment furnished under this and any other section of the specifications affecting work, equipment and materials to be installed under this Contract. It shall be the responsibility of the Contractor to obtain all related shop and working drawings to properly prepare his working drawings within the intent of the Specifications.
- D. The Contractor shall promptly prepare and submit the working drawings on sheets 24 inches by 36 inches with a ½-inch marginal space on three sides and a 2 inch marginal space for binding on the left side.
- E. Drawings shall be numbered consecutively and shall accurately and distinctly present the following:
 - 1. All working and installation dimensions.
 - 2. Arrangement and section views.
 - 3. Details, including complete information for making connections between work under this and other sections of the Contract.
 - 4. Units of equipment in the proposed positions for installation and the details of attachments and connections required, with dimensional locations referred to each other and to the structures.
- F. Each drawing shall contain a dated title block in the lower right-hand corner including the name of this project, the contract number and a descriptive title of equipment or work covered by the drawing.
- G. In submitting working drawings for review, all associated drawings relating to complete assembly of various parts necessary for a unit, shall not be submitted until the assembly of drawings is complete, so that these may be checked in relation to the assembly proposed.
- H. Acceptance of a working drawing will constitute acceptance of the subject matter thereof only and not of any other structure, material or apparatus shown or indicated.
- I. All items of electrical equipment constituting an operating system and any mechanical units involved therein or necessary for the functioning of such systems shall be submitted at the same time and shall include elementary wiring diagrams showing circuit functioning and necessary interconnection wiring diagrams for field installation.
- J. Working drawings furnished upon completion of the work shall be corrected to show any as built deviations from previously reviewed Working Drawings. To this end, the Contractor shall maintain accurate records of any deviation from that shown on the Working Drawings during the construction phase.

1.07 HAZARDOUS AREAS

- A. Equipment, materials and installation in areas designated as hazardous shall comply with National Electrical Code Articles 500, 501, 502 and 503.

- B. Equipment and materials installed in hazardous areas shall be UL listed for the appropriate hazardous area classification.

1.08 CODES, INSPECTION AND FEES

- A. Equipment, materials and installation shall comply with the requirements of the local authority having jurisdiction.
- B. Obtain all necessary permits and pay all fees required for permits and inspections.

1.09 TESTS AND SETTINGS

- A. Test systems and equipment furnished under Division 16 and repair or replace all defective work and equipment. Refer to the individual equipment sections for additional specific testing requirements.
- B. Make adjustments to the systems and instruct the Owner's personnel in the proper operation of the systems.
- C. In addition to the specific testing requirements listed in the individual sections, the following minimum tests and settings shall be performed.
 - 1. Mechanical inspection, testing and settings of circuit breakers, disconnect switches, protection relays, motor starters, overload relays, control circuits and equipment for proper operation.
 - 2. Check the full load current draw of each motor. Where power factor correction capacitors are provided the capacitor shall be in the circuit at the time of the measurement. Check ampere rating of thermal overloads for motors and submit a typed record to the Engineer of the same, including MCC cubicle location and driven load designation, motor service factor, horsepower, and Code letter. If incorrect thermal overloads are installed replace same with the correct size overload.
 - 3. Check power and control power fuse ratings. Replace fuses if they are found to be of the incorrect size.
 - 4. Check settings of the motor circuit protectors. Adjust settings to lowest setting that will allow the motor to be started when under load conditions.
 - 5. Check motor nameplates for correct phase and voltage. Check bearings for proper lubrication.
 - 6. Check rotation of motors prior to testing the driven load. Disconnect the driven equipment if damage could occur due to wrong rotation. If the rotation is for the driven equipment is not correct, disconnect the motor lead connections at the motor terminal box and reconnect for proper rotation.
 - 7. Check interlocking, control and instrument wiring for each system and/or part of a system to prove that the system will function properly as indicated by control schematic and wiring diagrams.

8. Inspect each piece of equipment in areas designated as HAZARDOUS to insure that equipment of proper rating is installed.
9. Verify all terminations at transformers, equipment, panels and enclosures by producing a 1, 2, 3 rotation on a phase sequenced motor when connected to "A," "B" and "C" phases.
10. Test the grounding system using the three point fall in potential method.
11. Test all 600 Volt wire insulation with a meg-ohm meter after installation. Make tests at 1,000V_{DC}. Submit a written test report of the results to the Engineer.

D. Insulation Resistance Testing

1. 600v Cable Test
2. Insulation resistance testing of all power, control, and signal conductors rated 600V or less shall be conducted utilizing a 1,000VDC megger. The cabling will be accepted when the insulation resistance is not less than five (5) megohm per volt, corrected to 20oC, at 1000VDC continuously for a period not less than 60 seconds. Record the insulation resistance valve at 15 second intervals.
3. Each distribution panel shall be tested with mains disconnected from the feeder, branches connected, branch circuit breakers closed, all fixtures in place and permanently connected, lamps removed or omitted from the sockets, and all wall switches closed. Feeders shall be tested with the feeders disconnected from the panels. Each individual power circuit shall be tested at the panel or motor control center with the power equipment connected for proper operation.
4. Insulation resistance tests of all rotating machines and transformers shall be conducted. Testing shall be in accordance with the test instrument manufacturer's recommendations.
5. The electrical equipment will be accepted when the insulation resistance is not less than one megohm per volt corrected to 20oC at 1000VDC continuously for a period not less than 60 seconds. Record the insulation resistance valve at 15 second intervals.
6. Test reports shall indicate date, weather conditions, cable size, length of run and resistance observed on a per conductor basis. Test shall be conducted phase to phase, phase to neutral and phase to ground for all feeders and branch circuits. Test results shall be given in "Ohms" at 20oC ambient. All tests and resistance readings shall be made per the applicable ANSI Standards which apply.

- E. Testing shall be scheduled and coordinated with the Engineer at least two weeks in advance. Provide qualified test personnel, instruments and test equipment.

1.10 SIZE OF EQUIPMENT

- A. Investigate each space in the structure through which equipment must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.

- B. The equipment shall be kept upright at all times during storage and handling. When equipment must be tilted for passage through restricted areas, brace the equipment to insure that the tilting does not impair the functional integrity of the equipment.

1.11 RECORD DRAWINGS

- A. As the work progresses, legibly record all field changes on a set of project contract drawings, hereinafter called the "record drawings."
- B. Record drawings shall accurately show the installed condition of the following items:
 - 1. One-line Diagram(s).
 - 2. Raceways and pullboxes.
 - 3. Conductor sizes and conduit fills.
 - 4. Panel Schedule(s).
 - 5. Control Wiring Diagram(s).
 - 6. Plan view, sizes and locations of switchgear, distribution transformers, substations, motor control centers and panelboards.
- C. Submit a schedule of control wiring raceways and wire numbers, including the following information:
 - 1. Circuit origin, destination and wire numbers.
 - 2. Field wiring terminal strip names and numbers.
- D. As an alternate, point-to-point connection diagrams showing the same information may be submitted in place of the schedule of control wiring raceways and wire numbers.
- E. Submit the record drawings and the schedule of control wiring raceways and wire numbers (or the point-to-point connection diagram) to the Engineer.

1.12 EQUIPMENT INTERCONNECTIONS

- A. Review shop drawings of equipment furnished under other Divisions of this Specification and prepare coordinated wiring interconnection diagrams or wiring tables. Submit copies of wiring diagrams or tables with Record Drawings.
- B. Furnish and install all equipment interconnections.

1.13 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be new (except where otherwise specified in drawings).
- B. Material and equipment of the same type shall be the product of one manufacturer and shall be UL listed.

1.14 EQUIPMENT IDENTIFICATION

- A. Identify equipment (disconnect switches, separately mounted motor starters, control stations, etc.) furnished under Division 16 with the name of the equipment it serves. Motor control centers, control panels, panelboards, switchboards, switchgear, junction or terminal boxes, transfer switches, etc., shall have nameplate designations as shown on the Drawings.
- B. Nameplates shall be engraved, laminated plastic, not less than 1/16-in thick by 3/4-in by 2-1/2-in with 3/16-in high white letters on a black background.
- C. Nameplates shall be screw mounted to NEMA 1 enclosures. Nameplates shall be bonded to all other enclosure types using an epoxy or similar permanent waterproof adhesive. Two sided foam adhesive tape is not acceptable. Where the equipment size does not have space for mounting a nameplate the nameplate shall be permanently fastened to the adjacent mounting surface.

1.15 DEMOLITION

- A. Survey the existing electrical systems and equipment identified for removal with representatives from the other trades prior to performing any demolition work. Identify all conduit and equipment to be removed with tags or paint.
- B. Where a piece of equipment is to be removed all associated ancillary components (e.g., solenoid valves, pressure switches, etc) and associated wiring and conduit shall also be removed.
- C. Equipment, building or structures scheduled for complete demolition shall be made safe from electrical shock hazard prior to demolition. Disconnect all electrical power, communications, alarm and signal system.
- D. Remove electrical work associated with equipment scheduled for demolition except those portions indicated to remain or be reused.
- E. Unless otherwise specifically noted, remove unused exposed conduit and support systems back to point of concealment including abandoned conduit above accessible ceiling finishes. Remove unused wiring back to source (or nearest point of usage).
- F. Repair adjacent construction and finishes damaged during demolition and extension work.
- G. Where electrical systems pass through the demolition areas to serve other portions of the premises, they shall remain or be suitably relocated and the system restored to normal operation.
- H. Coordinate electrical power outages to the electrical systems and equipment with the Owner. Where duration of proposed outage cannot be allowed by the Owner ([4] hour duration maximum), phase the retrofit work to allow the system or equipment to be re-connected to the electrical power system within the time frame allowed by the Owner or provide temporary power connections as required to maintain service to the systems or equipment. The temporary power can be from a generator or another part of the facility not affected by the outage provided there is sufficient spare capacity.
- I. The electrical and process equipment to be removed or relocated under this contract has been identified on the Drawings. The removal and or relocation of existing conduit, wire and

equipment have not been detailed on the Drawings. Survey the affected equipment and building areas before submitting bid proposal.

- J. Trace out existing wiring that is to be relocated, or removed and perform the relocation or removal work as required for a complete operating and safe system.
- K. Remove exposed conduits, wireways, outlet boxes, pull boxes and hangers made obsolete by the alterations, unless specifically designated to remain. Patch surfaces and provide blank covers for abandoned outlets which are removed.

1.16 DISPOSITION OF REMOVED MATERIALS AND EQUIPMENT

- A. It is intended that material and equipment indicated to be removed and disposed of by the Contractor shall, upon removal, become the Contractor's property and shall be disposed of off the site by the Contractor, unless otherwise directed by the Owner. A receipt showing acceptable disposal of any legally regulated materials or equipment shall be given to the Owner.
- B. PCBs, mercury and PCB/mercury contaminated equipment shall be removed, packaged, shipped and disposed of in accordance with all State and Federal regulations. Obtain the services of a firm licensed and regularly engaged in the removal of PCBs and PCB contaminated equipment. The firm shall be licensed in the State or States in which the contaminated material is handled, shipped and disposed. Pay all fees associated with the removal of the contaminated material and equipment and provide documentation showing acceptable disposal.
- C. Should the Contractor discover PCB or mercury contaminated equipment that was not identified; they shall cease work on or about the equipment and notify the Engineer immediately. The Contractor shall then proceed with the work as directed by the Engineer.
- D. The following electrical equipment shall be removed and shall be moved by the Contractor to a location on the site for storage as directed by the Owner:
 - 1. Waste Activated Sludge Pump #4.

1.17 INTERPRETATION OF DRAWINGS

- A. Unless specifically stated to the contrary, the Drawings are not intended to show exact locations of conduit runs. Coordinate the conduit installation with other trades and the actual supplied equipment.
- B. Install each 3 phase circuit in a separate conduit unless otherwise shown on the Drawings.
- C. Unless otherwise approved by the Engineer, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.
- D. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be provided for a complete raceway installation. Where home-runs indicate conduit is to be installed concealed or exposed the entire branch circuit shall be installed in the same manner. Unless otherwise indicated install branch circuit conduits exposed in process/industrial type spaces and concealed in finished spaces.

- E. Except where dimensions are shown, the locations of equipment, fixtures, outlets and similar devices shown on the Drawings are approximate only. Exact locations shall be determined by the Contractor and approved by the Engineer during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.
- F. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown.
- G. Redesign of electrical or mechanical work, which is required due to the Contractor's use of an alternate item, arrangement of equipment and/or layout other than specified herein, shall be done by the Contractor at his/her own expense. Redesign and detailed plans shall be submitted to the Engineer for approval. No additional compensation will be provided for changes in the work, either his/her own or others, caused by such redesign.
- H. It is the intent of these Specifications that the Electrical Systems shall be suitable in every way for the service required. All materials and all work that may be implied as being incidental to the work of this Section shall be furnished at no additional cost to the Owner.

1.18 SEISMIC RESTRAINTS

- A. Seismic restraints shall be provided for all electrical systems including but not limited to conduits, busways, cable trays, pull boxes, free standing or wall mounted panels and cabinets, motor control centers, switchboards, switchgear, transformers, disconnect switches, individually mounted motor starters, variable frequency drives, power factor correction capacitors, lighting fixtures, emergency battery units and other similar electrical equipment installed under Division 16.
- B. Use seismic criteria, Tables and standard restraint details found in the latest edition of the SMACNA Seismic Retraining Manual for the seismic restraints. The restraints shall be selected from the Tables that represent the highest seismic hazard class or level possible within the State, Commonwealth or District in which the project resides. Where materials other than steel are specified, members of equal strength to those in the standards shall be provided.
- C. Materials of construction for seismic restraints shall be same as those specified for the equipment supports and area classifications. However, all bolts shall be stainless steel 316 L alloy regardless of the locations.

PART 2 PRODUCTS

2.01 CONDUITS AND FITTING

- A. Rigid Steel Conduit
 - 1. Rigid steel conduit interior and exterior shall be hot-dipped galvanized and be as manufactured by the Allied Tube and Conduit Corp.; Wheatland Tube Co.; Western Tube & Conduit Corporation, or equal.
- B. PVC Coated Rigid Steel Conduit

1. PVC coated rigid steel conduit shall have a minimum 0.040-in thick, polyvinyl chloride coating permanently bonded to hot-dipped galvanized steel conduit and an internal chemically cured urethane or enamel coating. The ends of all couplings, fittings, etc., shall have a minimum of one pipe diameter in length of PVC overlap. PVC conduit and fittings shall be manufactured by Occidental Coating Company; "Plasti-Bond Red" as manufactured by Robroy Industries; "Ocal" by Thomas & Betts Inc., Perma-Cote, or equal.

C. Liquidtight Flexible Metal Conduit, Couplings and Fittings

1. Liquidtight flexible metal conduit shall be Sealtite, Type UA, manufactured by the Anaconda Metal Hose Div.; Anaconda American Brass Co.; American Flexible Conduit Co., Inc.; Universal Metal Hose Co., or equal.
2. Fittings used with liquidtight flexible metal conduit shall be of the screw-in type as manufactured by the Thomas & Betts Co.; Crouse-Hinds Co., or equal.

D. Flexible Couplings

1. Flexible couplings shall be type ECGJH as manufactured by the Crouse-Hinds Co.; Appleton Electric Co.; Killark Electric Manufacturing Co., or equal.

E. Boxes and Fittings

1. Pressed steel switch and outlet boxes shall be hot-dipped galvanized as manufactured by the Raco Manufacturing Co.; Adalet Co.; O.Z. Manufacturing Co., or equal.
2. For use in NEMA 1 areas, terminal boxes, junction boxes, pull boxes etc, shall be galvanized sheet steel with continuously welded seams. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. Covers shall be gasketed and fastened with stainless steel 316 L alloy screws. Terminal boxes shall be furnished with hinged doors, terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20 Amps, 600 Volt. Boxes shall be as manufactured by Hoffman Engineering Co.; Lee Products Co.; Keystone/Rees, Inc., or equal.
3. NEMA 4 terminal boxes, junction boxes, pull boxes, etc, shall be sheet stainless steel 316 L alloy unless otherwise shown on the Drawings. Boxes shall have continuously welded seams and mounting feet. Welds shall be ground smooth. Boxes shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14 gauge metal and covers shall not be less than 12 gauge metal. Covers shall have a continuous gasket on all four sides and be fastened with stainless steel 316 L alloy clamps. Terminal boxes shall be furnished with hinged doors, terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20 Amp, 600 Volt. Boxes shall be as manufactured by Hoffman Engineering Co.; Lee Products Co.; Keystone/Rees, Inc., or equal.
4. NEMA 4X terminal boxes, junction boxes and pull boxes shall be fiberglass reinforced plastic with stainless steel 316 L alloy hardware and covers having a continuous gasket on all four sides. Terminal boxes shall be furnished with hinged doors, terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20 Amps, 600 Volt. Boxes shall be as manufactured by Hoffman Engineering Co.; Lee Products Co.; Keystone/Rees, Inc., or equal.

5. All boxes and fittings used with PVC coated conduit shall be furnished with a PVC coating bonded to the metal, the same thickness as used on the coated steel conduit. The ends of couplings and fittings shall have a minimum of one pipe diameter PVC overlap to cover threads and provide a seal.
6. Steel elbows and couplings shall be hot-dipped galvanized. Elbows and couplings used with PVC coated conduit shall be furnished with a PVC coating bonded to the steel, the same thickness as used on the coated steel conduit.
7. Conduit hubs shall be as manufactured by Myers Electric Products, Inc. or equal.
8. Conduit wall and floor seals for sleeved openings shall be type CSMI as manufactured by the O.Z./Gedney Co.; or equal.
9. Explosion proof fittings shall be as manufactured by the Crouse-Hinds Co.; Appleton Electric Co.; O.Z./Gedney Co., or equal.
10. Conduit sealing bushings shall be O.Z./Gedney Type CSB or equal.
11. Combination expansion-deflection fittings embedded in concrete shall be Type XD as manufactured by Crouse-Hinds Co.; Type AXDX as manufactured by O.Z./Gedney Co. Type DF as manufactured by Appleton Electric Co., or equal.
12. Combination expansion-deflection fittings installed exposed shall be Type XD as manufactured by Crouse-Hinds Co.; Type AXDX as manufactured by O.Z./Gedney Co. Type DF as manufactured by Appleton Electric Co., or equal.

F. Conduit Mounting Equipment

1. In dry indoor areas, hangers, rods, backplates, beam clamps, channel, etc. shall be galvanized iron or steel.
2. PVC coated steel channel with stainless steel 316 L alloy hardware shall be used in areas designated "WET" and "CORROSIVE" on the Drawings and in outdoor locations. Fiberglass channel shall be resistant to the chemicals present in the area in which it is used.

G. Wall and Floor Slab Opening Seals

1. Wall and floor slab openings shall be sealed with "FLAME-SAFE" as manufactured by the Thomas & Betts Corp.; Pro Set Systems; Neer Mfg. Co.; Specified Technologies, Inc., or equal.

H. Cold Galvanizing Compound

1. Cold galvanizing compound shall be as manufactured by ZRC Products Company, a division of Norfolk Corp., or equal.

2.02 WIRE, CABLE AND ACCESSORIES

- A. Wires and cables shall be of annealed, 98 percent conductivity, soft drawn copper.

- B. All conductors shall be stranded.
- C. Except for control, signal and instrumentation circuits, wire smaller than No. 12 AWG shall not be used.
- D. Wire for circuits over 150 Volts to ground shall be NEC type XHHW-2 for sizes up to No. 4/0 AWG and Type RHW-2 for sizes greater than No. 4/0 AWG as manufactured by Okonite Co.; Southwire Co., or equal.
- E. Wire for control, status and alarm circuits shall be No.14 AWG NEC type XHHW-2, stranded as manufactured by the Okonite Co.; Carol Cable Co. Inc. West; Pirelli Cable Corp., or equal.
- F. Wire for process instrumentation signals (i.e., 1-5 VDC, 4-20 mA), R.T.D., potentiometer and similar signals shall be:
 - 1. Single pair cable:
 - a. Conductors: 2- No.18 tinned copper stranded and twisted on 2-in lay
 - b. Insulation: FEP with 300 Volt, 105 degrees C rating
 - c. Shield: 100 percent aluminum polyester with a 20 AWG stranded tinned copper drain wire
 - d. Jacket: Fluorinated Ethylene Propylene with UL 910, and manufacturer's identification
 - e. Color code: Red and Black
 - f. Max overall diameter: 0.262-in
 - g. Miscellaneous: UL listed for underground wet location use
 - h. Manufacturers: Belden No. 88760, or equal
 - 2. Three conductor (triad) cable:
 - a. Conductors: 3- No.18 stranded and twisted on 2-in lay
 - b. Insulation: FEP with 300 Volt, 105 degrees C rating
 - c. Shield: 100 percent aluminum polyester with a 20 AWG stranded tinned copper drain wire
 - d. Jacket: Fluorinated Ethylene Propylene with UL 910, and manufacturer's identification
 - e. Color code: Black, White and Red
 - f. Max overall diameter: 0.276-in
 - g. Miscellaneous: UL listed for underground wet location use
 - h. Manufacturers: Belden No. 88770, or equal
 - 3. Multiple pair cables (where shown on the Drawings):
 - a. Conductor: multiple 2- No.22 stranded and twisted on a 2-in lay
 - b. Insulation: FEP with 300 Volt, 105 degrees C rating
 - c. Shield: Individual pairs shielded with 100 percent aluminum polyester with a 20 AWG stranded tinned copper drain wire
 - d. Jacket: Fluorinated Ethylene Propylene with UL 910, and manufacturer's identification
 - e. Miscellaneous: UL listed for underground wet location use
 - f. Manufacturers: Belden No. 82504, 82506, 82509 or equal

- G. Splices for power wiring shall be compression type connectors insulated with a heat shrink boot or outer covering and epoxy filling. Splice kits shall be as manufactured by Raychem; Ideal Industries; 3M Co., or equal.
- H. Motor connections shall be ring type mechanical compression terminations installed on the branch circuit wires and the motor leads and secured with bolt, nut and spring washer. Connections shall be insulated with a Raychem Type RVC, roll-on stub insulator, or equal.
- I. Termination connectors for control wiring shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.
- J. Splices for control wiring shall be insulated compression type connectors of the expanded vinyl insulated parallel or pigtail type as manufactured by Ideal Industries; 3M Co.; Panduit Corp., or equal.
- K. Termination connectors for shielded instrumentation wiring shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp., or equal.
- L. Wire markers shall be "Omni-Grip" as manufactured by the W.H. Brady Co.; Thomas & Betts Co.; 3M Co., or equal.
- M. Wire and cables with diameters exceeding the capacity of the "Omni-Grip" shall be marked with pre-printed, self-adhesive vinyl tapes as manufactured by the W.H. Brady Co.; Panduit Corp., or equal.

2.03 WIRING DEVICES

A. Device Plates

- 1. Plates for indoor flush mounted devices shall be of the required number of gangs for the application involved and shall be as follows:
 - a. Administration type buildings: Smooth, high impact nylon of the same manufacturer and color as the device. Final color to be as selected by the Architect.
 - b. Where permitted in other areas of the plant, flush mounted devices in cement block construction shall be Type 302 high nickel (18-8) stainless steel 316 L alloy of the same manufacturer as the devices.
- 2. Plates for indoor surface mounted device boxes shall be cast metal of the same material as the box, Crouse-Hinds, No. DS23G and DS32G, or equal.
- 3. Oversized plates shall be installed where standard plates do not fully cover the wall opening.
- 4. Multiple surface mounted devices shall be ganged in a single, common box and provided with an adapter, if necessary, to allow mounting of single gang device plates on multi-gang cast boxes.
- 5. Engraved device plates shall be provided where required.

2.04 MISCELLANEOUS EQUIPMENT

A. Control Stations

1. Control stations shall be heavy-duty type, with full size operators. Momentary contact stop buttons shall have a lockout latch that can be padlocked in the open position.
2. NEMA 4 enclosures shall be stainless steel 316 L alloy.
3. NEMA 4X enclosures shall be stainless steel 316 L alloy.
4. NEMA 7 enclosures shall be cast aluminum.
5. Control stations shall be Square D Class 9001; Cutler Hammer Co.; General Electric Company; Allen Bradley Company, or equal.

B. Control Relays

1. Control relays shall be heavy duty machine tool type, with 10 Amps, 300 Volt convertible contacts. Number of contacts and coil voltage shall be as shown on the Drawings. General use relays shall be General Electric Co., Catalog No. CR120B or equal by Square D Co. or Allen-Bradley Co. Latching relays shall be General Electric Co., CR120BL, equal by Square D Co., or Allen-Bradley Co.
2. Time delay relays shall be pneumatic, 600 Volt, 20 Amp contacts, with calibrated knob operated adjustment. On delay and off delay types and timing ranges shall be as shown on the Drawings. Relays shall be Agastat, Model 7012 or 7022, or equal.

2.05 GROUNDING

- A. Grounding conduit hubs shall be malleable iron type similar to Thomas & Betts Co.; Cat No. 3940 (3/4-in conduit size) by Burndy; O.Z./Gedney Co., or equal, and of the correct size for the conduit.

PART 3 EXECUTION

3.01 SLEEVES AND FORMS FOR OPENINGS

- A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.
- B. Exact locations are required for stubbing-up and terminating concealed conduit. Obtain shop drawings and templates from equipment vendors or other subcontractors and locate the concealed conduit before the floor slab is poured.
- C. Where setting drawings are not available in time to avoid delay in scheduled floor slab pours, the Engineer may allow the installations of such conduit to be exposed. Requests for this deviation shall be submitted in writing. No additional compensation for such change will be allowed.

- D. Seal all openings, sleeves, penetration and slots.

3.02 CUTTING AND PATCHING

- A. Cutting and patching shall be done in a thoroughly workmanlike manner. Sawcut concrete and masonry prior to breaking out sections.
- B. Core drill holes in concrete floors and walls as required.
- C. Install work at such time as to require the minimum amount of cutting and patching.
- D. Do not cut joists, beams, girders, columns or any other structural members.
- E. Cut opening only large enough to allow easy installation of the conduit.
- F. Patching to be of the same kind and quality of material as was removed.
- G. The completed patching work shall restore the surface to its original appearance or better.
- H. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed.
- I. Remove rubble and excess patching materials from the premises.
- J. When existing conduits are cut at the floor line of wall line, they shall be filled with grout of suitable patching material.

3.03 INSTALLATION

- A. Any work not installed according to the Specifications shall be subject to change as directed by the Engineer. No extra compensation will be allowed for making these changes.
- B. Electrical equipment shall be protected at all times against mechanical injury or damage by water. Electrical equipment shall not be stored outdoors. Electrical equipment shall be stored in dry permanent shelters. Do not install electrical equipment in its permanent location until structures are weather-tight. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and tested as directed by the Engineer, or shall be replaced at no additional cost at the Engineer's discretion.
- C. Equipment that has been damaged shall be replaced or repaired by the equipment manufacturer, at the Engineer's discretion.
- D. Repaint any damage to factory applied paint finish using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted per the field painting specifications in Section [09902] [09 91 00], at no additional cost to the Owner.
- E. Coordinate the conduit installation with other trades and the actual supplied equipment.
- F. Install each 3 phase circuit in separate conduit.
- G. Maintain a minimum 24 inch separation distance between conduits containing instrumentation / signal cables and conduits containing power wiring.

- H. Unless otherwise approved by the Engineer, conduit installed interior to the building shall be installed exposed; conduit installed exterior to the building shall be concealed.
- I. Verify the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.
- J. Exact locations of electrical equipment shall be determined by the Contractor and approved by the Engineer during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

3.04 BOXES AND FITTINGS

- A. PVC coated rigid steel conduit shall be used in areas designated "WET" or "CORROSIVE."
- B. PVC conduit shall be used for concrete encased underground duct banks except as specified in Paragraph 3.05B above.
- C. All boxes shall be metal.
- D. Terminal boxes, junction boxes and pull boxes shall have NEMA ratings suitable for the location in which they are installed.
- E. Conduit wall seals shall be used where underground conduits penetrate walls.
- F. Conduit sealing bushings shall be used to seal conduit ends exposed to the weather.
- G. No conduit smaller than 3/4-in electrical trade size shall be used, nor shall any have more than the equivalent of three 90 degree bends in any one run. Pull boxes shall be provided as required or directed.
- H. No wire shall be pulled until the conduit system is complete in all details.
- I. The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction.
- J. Conduit supports, other than for underground raceways, shall be spaced at intervals of 8-ft or less.
- K. Conduit hangers shall be attached to structural steel by means of beam or channel clamps. Where attached to concrete surfaces, concrete inserts of the spot type shall be provided.
- L. All conduits shall be run at right angles to and parallel with the surrounding wall and shall conform to the form of the ceiling. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduits shall be run perfectly straight and true.
- M. Conduit terminating in pressed steel boxes shall have double locknuts and insulated bushings.
- N. Conduit terminating in NEMA 3R, 4, 4X and 12 enclosures shall be terminated with Myers type conduit hubs.

- O. Conduits containing equipment grounding conductors and terminating in sheet steel boxes shall have insulated throat grounding bushings.
- P. Conduits shall be installed using threaded fittings.
- Q. Liquidtight flexible metal conduit shall be used for all motor terminations, the primary and secondary of transformers, generator terminations and other equipment where vibration is present.
- R. Flexible couplings shall be used in hazardous locations for all motor terminations and other equipment where vibration is present.
- S. Where conduits pass through openings in walls or floor slabs, the remaining openings shall be sealed against the passage of flame and smoke.
- T. PVC conduit to non-metallic box connections shall be made with PVC socket to male thread terminal adapters with neoprene O-ring and PVC round edge bushings.
- U. Conduit ends exposed to the weather shall be sealed with conduit sealing bushings.
- V. PVC conduit shall be supported with non-metallic clamps, PVC coated steel racks and stainless steel 316 L alloy hardware.
- W. PVC boxes, conduit fittings, etc. with integral hubs shall be solvent welded directly to the PVC conduit system.
- X. Non-metallic boxes with field drilled or punched holes shall be connected to the PVC conduit system with threaded and gasketed PVC Terminal Adapters.
- Y. All conduit entering or leaving a motor control center, switchboard or other multiple compartment enclosure shall be stubbed up into the bottom horizontal wireway or other manufacturer designated area, directly below the vertical section in which the conductors are to be terminated.
- Z. Conduit sealing and drain fittings shall be installed in areas designated as NEMA 7.
- AA. All conduit which may under any circumstance contain liquids such as water, condensation, liquid chemicals, etc, shall be arranged to drain away from the equipment served. If conduit drainage is not possible, conduit seals shall be used to plug the conduits.
- BB. Where no type or size is indicated for junction boxes, pull boxes or terminal cabinets, they shall be sized in accordance with the requirements of N.E.C. Article 370.
- CC. Miscellaneous steel for the support of fixtures, boxes, transformers, starters, contactors, panels and conduit shall be furnished and installed.
- DD. Steel channels, flat iron and channel iron shall be furnished and installed for the support of all electrical equipment and devices, where required, including all anchors, inserts, bolts, nuts, washers, etc. for a rigid installation.

3.05 WIRE, CABLE AND ACCESSORIES

- A. Uniquely identify all wires, cables and each conductor of multi-conductor cables (except lighting and receptacle wiring) at each end with wire and cable markers.
- B. Use lubrications to facilitate wire pulling. Lubricants shall be UL approved for use with the insulation specified.
- C. All wire shall be color coded or coded using electrical tape in sizes where colored insulation is not available. Where tape is used as the identification system, it shall be applied in all junction boxes, and other accessible intermediate locations as well as at each termination.
- D. The following coding shall be used:

System	Wire	Color
208Y/120, Volts	Neutral	White
3-Phase, 4-Wire	Phase A	Black
Phase B	Red	
Phase C	Blue	
480Y/277 Volts	Neutral	White
3-Phase, 4-Wire	Phase A	Brown
Phase B	Orange	
Phase C	Yellow	

- E. Power conductors: Terminations shall be die type or set screw type pressure connectors as specified. Splices (where allowed) shall be die type compression connector and waterproof with heat shrink boot or epoxy filling. Aluminum conductors (where specified) shall employ terminations and splices specifically designed for aluminum conductors.
- F. Control Conductors: Termination on saddle-type terminals shall be wired directly with a maximum of two conductors. Termination on screw type terminals shall be made with a maximum of two spade connectors. Splices (where allowed) shall be made with insulated compression type connectors.
- G. Instrumentation Signal Conductors (including graphic panel, alarm, low and high level signals): terminations same as for control conductors. Splices allowed at instrumentation terminal boxes only.
- H. Except where permitted by the Engineer no splices will be allowed in manholes, handholes or other below grade located boxes.
- I. Splices shall not be made in push button control stations, control devices (i.e., pressure switches, flow switches, etc.), conduit bodies, etc.
- J. Analog Instrumentation cables shall be installed in rigid steel raceways as specified. All circuits shall be installed as twisted pairs or triads. In no case shall a circuit be made up using conductors from different pairs or triads. Triads shall be used wherever three wire circuits are required.

- K. Terminal blocks shall be provided at all instrument cable junction and all circuits shall be identified at such junctions.
- L. Shielded instrumentation wire, shall be run without splices between instruments, terminal boxes, or panels.
- M. Shields shall be grounded as recommended by the instrument manufacturer and isolated at all other locations. Terminal blocks shall be provided for inter-connecting shield drain wires at all junction boxes. Where individual circuit shielding is required, each shield circuit shall be provided with its own block.
- N. Electronic transmission shall be via stranded, shielded, twisted conductors of not less than 18 AWG conductor wire. All termination points shall have terminal lugs. Instruments and panels shall be grounded to the nearest plant equipment ground. Shielded cables shall have the shield grounded at one point for each loop; preferably at the point of origin. Signal wires shall not be run in conduit containing wire used for any other purpose.

3.06 WIRING DEVICES

- A. Do not install flush mounted devices in areas designated DAMP, WET or WET/CORROSIVE. Provide surface mounted devices in these areas.
- B. Provide weatherproof devices covers in areas designated WET or WET/CORROSIVE.

3.07 GROUNDING

- A. Run grounding electrode conductors in rigid steel conduits. Bond the protecting conduits to the grounding electrode conductors at both ends. Do not allow water pipe connections to be painted. If the connections are painted, disassemble them and re-make them with new fittings.
- B. Install equipment grounding conductors with all feeders and branch circuits.
- C. Metal conduits stubbed into a motor control center shall be terminated with insulated grounding bushings and connect to the motor control center ground bus. Bond boxes mounted below motor control centers to the motor control center ground bus. Size the grounding wire in accordance with NEC Table 250-95, except that a minimum No. 12 AWG shall be used.
- D. Liquid tight flexible metal conduit in sizes 1-1/2-in and larger shall have bonding jumpers. Bonding jumpers shall be external, run parallel (not spiraled) and fastened with plastic tie wraps.
- E. Seal exposed connections between different metals with No-Oxide Paint Grade A or equal.
- F. Care shall be taken to ensure good ground continuity, in particular between the conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.
- G. Notify the Engineer immediately if the resistance to ground for any building or system is greater than five ohms.

END OF SECTION

