

CITY OF SANIBEL

PROJECT MANUAL FOR
DONAX WATER RECLAMATION FACILITY
POST HURRICANE IAN REPAIRS & HARDENING

ITB-UT-0-2026/BS

NOVEMBER 17, 2025



City of Sanibel
Office of the Procurement Manager
800 Dunlop Road, Sanibel, FL 33957
(239)472-6397

BIDS DUE BY: 2:30 PM, (ET) December 18, 2025

PRE-BID CONFERENCE: NONE

NO QUESTIONS WILL BE ACCEPTED AFTER: 5:00 PM, (ET) December 8, 2025, all questions must be submitted in writing to jason.goodrich@mysanibel.com and received by stated time.

SEALED ENVELOPES MUST BE MARKED WITH THE TITLE OF THE BID, BID NUMBER, NAME AND ADDRESS OF THE BIDDER.

Courier Packages (FedEx, UPS) shall clearly state on the outer packaging, the Invitation to Bid Title and the Invitation to Bid Number. If the proper information is not on the courier's outer packaging the Bid/RFP may be sent back to the Vendor without being opened and/or given consideration for that project.

DONAX WATER RECLAMATION FACILITY POST HURRICANE IAN REPAIRS & HARDENING

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Donax Water Reclamation Facility Post Hurricane Ian Repairs & Hardening (Included by Reference)	53 Sheets
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CITY OF SANIBEL, FLORIDA

ADVERTISEMENT FOR BIDS

Legal Notice is hereby given that sealed proposals will be received at the Office of the Procurement Manager, City of Sanibel, Florida, at City Hall, 800 Dunlop Road, Sanibel, until 2:30 P.M., on Thursday December 18, 2025 and shortly thereafter will be publicly opened and read aloud. Any proposal offered later than the above time will be returned unopened.

The work for which proposals are to be received consists of the following:

DONAX WATER RECLAMATION FACILITY POST HURRICANE IAN REPAIRS & HARDENING

Proposals shall be properly and completely executed on a standard proposal form. Each proposal shall be accompanied by an acceptable certified check or cashier's check made payable to the City of Sanibel, or an acceptable Bidders Bond, in an amount not less than five percent (5%) of the total bid price.

The Contractor to whom the work is awarded will be required to furnish an acceptable Surety Bond in an amount of one hundred percent (100%) of the contract price.

No bidder may withdraw his proposal within a period of sixty (60) days following the date set for receiving proposals. The City of Sanibel reserves the right to hold any and all bids for a period of not more than sixty (60) days and said bids shall be and remain valid and in full force and effect during said period. The City of Sanibel reserves the right to reject any and all proposals and to waive informalities.

Plans and Specifications for the work may be obtained online at:

<https://www.mysanibel.com/297/City-Bids>

Brett Schira
Procurement Manager
AFFIDAVIT REQUESTED
PUBLISH ONE TIME
Fort Myers News-Press
November 17, 2025

INFORMATION FOR BIDDERS

1.01 SCOPE

- A. The work described by these specifications is located at the Donax Water Reclamation Facility (WRF), owned by the City of Sanibel.
- B. The contract work provides for the **Donax Water Reclamation Facility Post Hurricane Ian Repairs & Hardening** and other related items pertinent and incidental thereto including the furnishing of all labor, materials, supplies, equipment, work and services, ready for satisfactory and continuous operation, in accordance with the drawings and specifications.
- C. The work included in this contract is described briefly as follows:
 - (1) Supplemental Carbon System to Mitigate Post-Ian Reduced Influent CBOD.
 - (2) Wastewater Collection System SCADA Control Room Improvements.
 - (3) Sodium Hypochlorite Feed Line Hardening
 - (4) Replace Effluent Flow Meter.
 - (5) Chlorine Contact Tank No. 1 Repairs and Coating.
 - (6) Internal Recycle Pumping Systems to Mitigate Post-Ian Reduced Influent CBOD.
 - (7) Replacement of Inlet Valves for Fine Screens.
- D. A purchase order for the project is anticipated in January 2026.

1.02 CONTRACT DOCUMENTS AND SPECIFICATIONS

- A. Work to be performed shall be in accordance with drawings and specifications prepared by Tetra Tech, Inc. and the City of Sanibel.

1.03 BIDDER TO EXAMINE SITE

- A. All bidders are to inform themselves of the conditions under which the work is to be performed, the site of the work, the obstacles which may be encountered, and all other relevant matters concerning the work to be performed. The successful bidder will not be allowed any extra compensation by reason of any matter or thing concerning which said bidder might have fully informed themselves because of their failure to have so informed themselves prior to the bidding.

1.04 INFORMATION NOT GUARANTEED

- A. All information given relating to borings, material encountered, and groundwater is from the reports of the boring CONTRACTOR. Such information is furnished only for the information and convenience of the bidders. It is understood and agreed that the OWNER does not warrant or guarantee as to the accuracy or completeness of such information. Each bidder must satisfy themselves regarding the character, quantities, and conditions of the various materials and work to be done.
- B. It is further understood and agreed that the bidder or the CONTRACTOR will not use any information made available to themselves or obtained by any examination made by them in any manner as a basis or ground of claim or demand of any nature against the OWNER arising from or by reason of any variance which may exist between the information offered and the actual materials and structures encountered during the construction work.

1.05 QUESTIONS REGARDING CONTRACT DOCUMENTS

- A. In general, no answer will be given in reply to an oral question if the question involves an interpretation of the intent or meaning of the drawings or contract documents, or the equality or use of products or methods other than those definitely designated or described on the drawings or in the specifications. Any information given to bidders other than by means of the drawings and contract documents or by addenda as described below is given informally and shall not be used as the basis of a claim against the OWNER or the Engineer.
- B. To receive consideration, such questions shall be submitted in writing to the OWNER at least **TEN (10)** days before the advertised date for receipt of bids. If the question involves equality or use of products or methods, it must be accompanied by drawings, specifications, or other data, in sufficient detail to enable the OWNER to determine the equality or suitability of the product or method. In general, the OWNER will neither approve nor disapprove particular products prior to the opening of the bids; such products will be considered when offered by the CONTRACTOR for incorporation into the work.
- C. The OWNER will arrange as addenda, which shall become a part of the Contract, all questions received as above provided, with his decision regarding each. Addenda will be posted at least **FIVE (5)** days prior to the receipt of bids. It shall be the responsibility of the CONTRACTOR, prior to submitting a proposal, to check the DemandStar online marketplace to download any and all addenda associated with the project. CONTRACTOR shall acknowledge issued addenda on Proposal document page (P-2).
- D. Unless such action shall have been taken by the CONTRACTOR and approval obtained, he agrees to use the product or method designated or described in the specifications or as amended by these addenda.

1.06 PROPOSAL FORM

- A. All bids must be submitted upon the Proposal Form which will be furnished by the OWNER. The Proposal Form shall be completely executed and shall give the price bid for each item of work proposed, both in words and figures, and shall be signed by the bidder.
- B. In the event of a discrepancy between the prices written in words and prices written in figures, the prices written in words shall govern.
- C. The successful bidder shall be prepared to complete the work within **THREE HUNDRED TWENTY (320)** calendar days of the Notice to Proceed.

1.07 LETTER FROM SURETY

- A. The CONTRACTOR shall submit with their executed bid proposal a letter or statement from their surety company that it will execute and deliver a one hundred percent (100%) Performance and Payment Bond.

1.08 AWARD OF CONTRACT

- A. Lump Sum Proposals - The award of Contract shall be made to the low, responsive and responsible bidder on the lump sum proposals submitted for the work. The Contract shall be deemed as having been awarded when formal notice shall have been served upon the successful bidder by an officer or agent of the OWNER duly authorized to give such notice.
- B. Unit Price Proposals
 - (1) The award of the Contract will be made to the lowest responsible bidder on the total bid price given on the Proposal Form, page P-1. The Contract shall be deemed as having been awarded when formal notice shall have been served upon the successful bidder by an officer or agent of the OWNER duly authorized to give such notice.
 - (2) The quantities listed in the unit price proposal form are to be considered as approximate and are to be used for the comparison of bids only. The unit prices to be tendered by the bidders are to be tendered expressly for the scheduled quantities, as they may be increased or decreased as hereinafter provided. Payments, except for lump sum items in the unit price Contract, will be made to the CONTRACTOR for the actual quantities of work performed or materials furnished in accordance with the plans and specifications; and it is understood that the scheduled quantities of work to be done and materials to be furnished may each be increased or diminished as hereinbefore provided without in any way invalidating the unit price bid. Where there is a conflict between the unit price and

the extension thereof made by the bidder, the unit price shall govern, and the Engineer shall be authorized to make a correct extension of such unit bid price and to use such corrected extension in comparing bids.

- (3) When bids are requested on "Alternate" items, the City reserves the right to select the lowest responsible bidder based upon either the base bid or the base bid with any or all of the alternate bid prices.
- (4) The City reserves the right to accept or reject any or all bids and to waive any formal irregularities in the bids, when deemed to be in the best interest of the City.

1.09 BID SECURITY

- A. Each bid shall be accompanied by a cashier's check made payable to the OWNER or an acceptable bidder's bond in an amount of not less than five percent (5%) of the total bid price. The checks will be returned to all except the three lowest formal bidders within three days after the date of opening the bids. Any checks remaining with the OWNER shall be returned upon execution of a contract.

1.10 EXPERIENCE AND ABILITY OF CONTRACTOR

- A. It is the intent of the OWNER not to award the Contract to any bidder who does not furnish satisfactory evidence they have the ability and experience in this class of work, and that they have sufficient capital and plant to enable them to prosecute the same successfully and to complete it in the time named in the proposal. CONTRACTOR shall have a minimum of **FIVE (5)** years' experience with similar projects.

1.11 EXECUTION OF CONTRACT

- A. The successful bidder to whom the Contract is awarded shall be required to execute **three (3)** copies of the Construction Contract and **three (3)** copies of the Performance and Payment Bond.

1.12 FORFEITURE OF BID SECURITY

- A. In the event that the party to whom the Contract is awarded shall fail or neglect to execute the Contract and furnish satisfactory bonds within TEN (10) days after the OWNER has notified him that the Contract is ready for execution, the OWNER may determine that the bidder abandoned the Contract, and thereupon the proposal and acceptance shall be null and void; and the security accompanying the proposal shall be forfeited to and retained by the OWNER as liquidated damages for such failure and neglect, and to indemnify the OWNER for any loss which may be sustained by failure of the bidder to execute the Contract. After the execution of the Contract and the acceptance of the bonds by the OWNER, the bid securities which have been retained by the OWNER shall be returned to the respective bidders.

1.13 UNAVAILABILITY OF MATERIALS

- A. Bids must be based on use of the materials specified, subject to the provisions of any addenda issued. If the CONTRACTOR is unable to furnish or use any of the materials or equipment specified because of any order by a governmental agency limiting the manufacture or use, or because of the supply situation in the general market for such material or equipment, the CONTRACTOR shall offer substitutes therefor. The substitutes shall be suitable for the purpose, considering the factors of quality, serviceability, appearance, and maintenance. No substitute shall be used until it has been approved by the Engineer.
- B. No consideration will be given to the use of substitutes on account of market conditions unless the CONTRACTOR demonstrates that for the item in question, CONTRACTOR placed their order and submitted shop drawings without delay, that CONTRACTOR has shown due diligence in attempting to locate the item as specified, and that the unavailability is due to market conditions in general throughout the particular industry.
- C. If substitutes are used in the work, the compensation to be paid to the CONTRACTOR shall be subject to review and adjustment. As a general principle, if the Engineer shall determine that the substitute will be less satisfactory, the CONTRACTOR shall allow a credit to the OWNER; only "under unusual circumstances shall there be an increase in" compensation to the CONTRACTOR on account of substitution. The basis upon which the amount of price adjustments will be founded shall be the cost of the appropriate items at the time the bids were opened.

1.14 LOCAL LABOR AND MATERIALS

- A. Whenever possible, the CONTRACTOR, their sub-contractors, material personnel, or others who employ labor, shall employ such labor locally.

1.15 NONDISCRIMINATION IN EMPLOYMENT

- A. Contracts for work under this proposal may obligate the CONTRACTOR and sub-contractors not to discriminate in employment practices.
- B. Bidders must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain their eligibility to receive the award of the Contract.

1.16 RIGHT-OF-ACCESS

- A. The CONTRACTOR agrees that a representative of the OWNER or Engineer will have access to the work wherever it is in preparation of progress and that the CONTRACTOR will provide facilities for such access and inspection.

1.17 SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

- A. The successful bidder shall be responsible for all obligations prescribed as employer obligations under Chapter XVII of Title 29, Code of Federal Regulations, Part 1926, otherwise known as "Safety and Health Regulations for Construction."

1.18 UTILITIES

- A. All existing utility systems which conflict with the construction of the work herein shall be relocated or temporarily removed and replaced as required. Such relocating or temporary removal and replacement shall be accomplished at the expense of the CONTRACTOR, and the work shall be done by the Utility unless the Utility approves in writing that the work may be done by the CONTRACTOR.
- B. The CONTRACTOR shall make all necessary applications and arrangements and pay all fees and charges for electrical energy for power and light required for the construction of this Contract during its entire progress. CONTRACTOR shall provide and pay for all temporary wiring, switches, connections and meters.

1.19 EASEMENTS

- A. The OWNER will obtain right-of-way easements over and through certain private lands for the construction and rehabilitation. The width or limits of such rights-of-way will be defined by the OWNER before the work or construction shall begin. If the methods of construction employed by the CONTRACTOR are such as to require the use of land beyond the limits obtained, CONTRACTOR shall make their own agreements with the property owners affected for the use of such additional land and submit a copy of the agreement to the "owner".
- B. In all such easement rights-of-way, the CONTRACTOR shall be required to carefully remove the Owner's fences, or other obstacles to the construction procedure, and replace the same after the work is installed. The backfilling shall be to the grade of the existing ground level or to the grade as established by the Owner in the event the Owner permits the deposit of excess material upon such land.
- C. The cost of all such restoration of property shall be included and no additional payment will be allowed for this work.

1.20 OPERATIONS WITHIN RIGHT-OF-WAY

- A. In public thoroughfares, all operations of the CONTRACTOR, including those of temporary nature, must be confined within the applicable right-of-way limits. If the methods of the construction employed by the CONTRACTOR are such as to require the use of land beyond the public thoroughfares, CONTRACTOR shall make their own agreements with the property owners affected for the use of such additional land and submit a copy of the agreement to the "owner".

1.21 PUBLIC RECORDS

A. OWNER is a public agency subject to Chapter 119, Florida Statutes, the Public Records Law. As a CONTRACTOR or service provider to OWNER, CONTRACTOR is also subject to the Public Records Law pursuant to Section 119.0701, Florida Statutes, and shall comply with Florida's Public Records Law. Unless specifically exempted by Florida law, in whole or part, the CONTRACTOR shall:

- (1) Keep and maintain public records required by the OWNER in order to perform the service. This shall include all records relating to CONTRACTOR'S services provided to the OWNER and includes "all documents, papers, letters, maps, books, tapes, photographs, films, sound recordings, data processing software, or other material, regardless of the physical form, characteristics or means of transmission."
- (2) Upon request from the OWNER'S custodian of public records, provide the OWNER with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes, or as otherwise provided by law.
- (3) Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the CONTRACTOR does not transfer the records to the OWNER.
- (4) Upon completion of the contract, transfer, at no cost to the OWNER, all public records in possession of the CONTRACTOR, or keep and maintain public records required by the OWNER to perform the service. If the CONTRACTOR transfers all public records to the OWNER upon completion of the contract, the CONTRACTOR shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the CONTRACTOR keeps and maintains public records upon completion of the contract, the CONTRACTOR shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the OWNER, upon request from the OWNER'S custodian of public records, in a format that is compatible with the information technology systems of the OWNER.

B. As required by Section 119.0701(2)(a), the following contact information is provided to the CONTRACTOR in the format required by statute:

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:

SANIBEL CITY CLERK
800 DUNLOP ROAD
SANIBEL, FLORIDA 33957
(239) 472-3700
scotty.kelly@mysanibel.com

1.22 E-Verify

- A. In compliance with Section 448.095, Fla. Stat., CONTRACTOR and its sub-contractor must be registered with and use the E-Verify system to verify work authorization status of all employees hired after January 1, 2021.
- (1) CONTRACTOR shall require each of its sub-contractors to provide CONTRACTOR with an affidavit stating that the sub-contractor does not employ, contract with, or sub-contract with an unauthorized alien. CONTRACTOR shall maintain a copy of the sub-contractor's affidavit as part of and pursuant to the records retention requirements of this Agreement.
 - (2) The OWNER, CONTRACTOR, or any sub-contractor who has a good faith belief that a person or entity with which it is contracting has knowingly violated Section 448.09(1), Fla. Stat. or the provisions of this section shall terminate the contract with the person or entity.
 - (3) The OWNER, upon good faith belief that a sub-contractor knowingly violated the provisions of this section, but CONTRACTOR otherwise complied, shall promptly notify CONTRACTOR, and CONTRACTOR shall immediately terminate the contract with the sub-contractor.
 - (4) A contract terminated under the provisions of this section is not a breach of contract and may not be considered such. Any contract termination under the provisions of this section may be challenged pursuant to Section 448.095(2)(d), Fla. Stat. CONTRACTOR acknowledges that upon termination of this Agreement by the OWNER for a violation of this section by CONTRACTOR, CONTRACTOR may not be awarded a public contract for at least one (1) year. CONTRACTOR further acknowledges that CONTRACTOR is liable for any additional costs incurred by the OWNER as a result of termination of any contract for a violation of this section.
 - (5) Subcontracts. CONTRACTOR or sub-contractor shall insert in any subcontracts the clauses set forth in this section, including this subsection, requiring the sub-contractor to include these clauses in any lower tier subcontracts. CONTRACTOR shall be responsible for compliance by any sub-contractor or lower tier sub-contractor with the clauses set forth in this section.

PROPOSAL

CITY OF SANIBEL, FLORIDA

**DONAX WATER RECLAMATION FACILITY POST HURRICANE IAN REPAIRS &
HARDENING**

DUE DECEMBER 18, 2025 @ 2:30 PM

TO: CITY OF SANIBEL
Office of the Procurement Manager
800 Dunlop Rd.
SANIBEL, FLORIDA 33957

Pursuant to the advertisement for bids, the undersigned having read the Specifications and examined the Drawings prepared by Tetra Tech, Inc. and the City of Sanibel for the **DONAX WATER RECLAMATION FACILITY POST HURRICANE IAN REPAIRS & HARDENING** in the City of Sanibel, Florida hereby proposes to provide all materials, and all equipment, tools, etc., and to perform all labor necessary for furnishing the equipment as specified and described in said Specifications.

The Total Bid Price for the work based on the summation of the extensions of the unit prices on the attached itemized proposal is:

Item	Quantity	Total Price
Donax Water Reclamation Facility Post Hurricane Ian Repairs & Hardening	1	\$
TOTAL BID IN WORDS _____ _____ (In words)		
\$ _____ (In figures)		
NAME OF SUBMITTING CONTRACTOR _____ _____		

TIME OF COMPLETION

The undersigned further agrees to complete the fabrication and delivery of such work, ready for continuous and satisfactory operation in all respects, within **THREE HUNDRED TWENTY (320)** calendar days of the Notice to Proceed.

TIME OF VALIDITY

It is hereby agreed that this proposal shall remain in full force and effect and may not be withdrawn for a period of sixty (60) days from the date of receiving proposals by the City of Sanibel.

BID SECURITY

The undersigned encloses herewith a certified check or cashier's check payable to the City of Sanibel, Florida or a bidder's bond bonding the undersigned and surety to the City of Sanibel, Florida in an amount not less than five percent (5%) of the total bid price as set out above, guaranteeing that the undersigned will enter into contract for the performance of the work if this proposal is accepted.

ADDENDA

Receipt of Addenda Nos. _____ is hereby acknowledged.

REQUIRED BID ITEMS

No.	Name	Page Reference
1	Bid Package in sealed envelope marked with Title of Bid, Bid Number, Name & Address of Bidder	Cover page Invitation to Bid
2	Complete Proposal on form provided	Pages A-1 and P-1 through P-4
3	Complete Unit Price Proposal	Pages P-1 through P-4
4	Complete Similar Project Experience	Pages SPE-1 through SPE-6
5	Include Certified Check or Bid Bond 5% or more of total bid price	Pages A-1 and IB-4
6	Acknowledge issued addenda on page 2 of Proposal Form	Pages IB-2, P-2, GC-1
7	Letter or statement from Bidder's surety company it will execute and deliver a 100% Performance and Payment Bond	Page IB-3
8	Furnish evidence they have ability & experience, have sufficient capital and plant, and minimum 5-years of experience	Page IB-4, Pages SPE-1 through SPE-6

UNIT PRICE PROPOSAL

ITEM NO.	DESCRIPTION	EST. QUANT.	UNIT	UNIT PRICE	EXTENDED PRICE
1	Mobilization/Demobilization (Max 5%)	1	LS		
2	Bonds and Insurance	1	LS		
3	Indemnification	1	LS	\$1,000.00	\$1,000.00
4	General Conditions	1	LS		
5	Supplemental Carbon System to Mitigate Post-lan Reduced Influent CBOD	1	LS		
6	Wastewater Collection System SCADA Control Room Improvements	1	LS		
7	Sodium Hypochlorite Feed Line Hardening	1	LS		
8	Replace Effluent Flow Meter	1	LS		
9	Chlorine Contact Tank No. 1 Repairs and Coating	1	LS		
10	Internal Recycle Pumping Systems to Mitigate Post-lan Reduced Influent CBOD	1	LS		
11	Replacement of Inlet Valves for Fine Screens				
12	All Other Items Not Included in Bid Items Nos 1-11 Above				
13	Owner's Contingency	1	LS	\$100,000.00	\$100,000.00
TOTAL:					

Respectfully submitted,

Contractor
(Individual____) (Partnership____) or (Corporation____)

(SEAL)

Signed _____

Name (print) _____

Title _____

Address _____

City/State _____

Telephone _____

Fax _____

Email _____

DATE:

NOTE: The legal status of the bidder, whether as an individual, partnership or corporation, must be indicated above, and all pertinent information as required of the Specifications must be furnished.

SIMILAR PROJECT EXPERIENCE

DATE: _____

PROJECT IDENTIFICATION:

CITY OF SANIBEL

DONAX WATER RECLAMATION FACILITY POST HURRICANE IAN REPAIRS & HARDENING

List at least five (5) similar projects completed in the last ten (10) years that indicate the experience and qualifications of Bidder relevant to this project. Similar projects include:

- Chemical feed storage, pumping and piping systems
- Submersible pump stations and piping
- Concrete repair and coatings
- Miscellaneous yard piping at a fully operational wastewater treatment facility

At least one (1) project should include pipe tie-in, wet-tap or line stop that required the Bidder to prepare an approved maintenance of operations plan.

Bidder must include references from the respective clients in the fields below. Information should include Owner's name with contact person; description of work including Bidder's responsibilities; original contract price; final contract price; original contract time; actual time to complete the project; and any relevant circumstances or conditions about the project.

PROJECT NAME: _____

OWNER'S NAME: _____

CONTACT: _____ PHONE: _____

PROJECT DESCRIPTION: _____

ORIGINAL CONTRACT AMOUNT: \$ _____

FINAL CONTRACT AMOUNT: \$ _____

NUMBER AND DOLLAR AMOUNT OF CHANGE ORDERS: _____

ORIGINAL CONTRACT TIME (Substantial Completion): _____

ACTUAL TIME TO COMPLETE (Substantial Completion): _____

OTHER RELEVANT INFORMATION: _____

PROJECT NAME: _____

OWNER'S NAME: _____

CONTACT: _____ PHONE: _____

PROJECT DESCRIPTION: _____

ORIGINAL CONTRACT AMOUNT: \$ _____

FINAL CONTRACT AMOUNT: \$ _____

NUMBER AND DOLLAR AMOUNT OF CHANGE ORDERS: _____

ORIGINAL CONTRACT TIME (Substantial Completion): _____

ACTUAL TIME TO COMPLETE (Substantial Completion): _____

OTHER RELEVANT INFORMATION: _____

PROJECT NAME: _____

OWNER'S NAME: _____

CONTACT: _____ PHONE: _____

PROJECT DESCRIPTION: _____

ORIGINAL CONTRACT AMOUNT: \$ _____

FINAL CONTRACT AMOUNT: \$ _____

NUMBER AND DOLLAR AMOUNT OF CHANGE ORDERS: _____

ORIGINAL CONTRACT TIME (Substantial Completion): _____

ACTUAL TIME TO COMPLETE (Substantial Completion): _____

OTHER RELEVANT INFORMATION: _____

PROJECT NAME: _____

OWNER'S NAME: _____

CONTACT: _____ PHONE: _____

PROJECT DESCRIPTION: _____

ORIGINAL CONTRACT AMOUNT: \$ _____

FINAL CONTRACT AMOUNT: \$ _____

NUMBER AND DOLLAR AMOUNT OF CHANGE ORDERS: _____

ORIGINAL CONTRACT TIME (Substantial Completion): _____

ACTUAL TIME TO COMPLETE (Substantial Completion): _____

OTHER RELEVANT INFORMATION: _____

PROJECT NAME: _____

OWNER'S NAME: _____

CONTACT: _____ PHONE: _____

PROJECT DESCRIPTION: _____

ORIGINAL CONTRACT AMOUNT: \$ _____

FINAL CONTRACT AMOUNT: \$ _____

NUMBER AND DOLLAR AMOUNT OF CHANGE ORDERS: _____

ORIGINAL CONTRACT TIME (Substantial Completion): _____

ACTUAL TIME TO COMPLETE (Substantial Completion): _____

OTHER RELEVANT INFORMATION: _____

SPECIMEN FORM OF CONTRACT

THIS CONTRACT, made this _____ day of _____, 2026, by and between THE CITY OF SANIBEL, FLORIDA, hereinafter called "OWNER", and _____ a Florida profit corporation, hereinafter called "CONTRACTOR".

WITNESSETH: That for and in consideration of the covenants set forth below and other good and valuable consideration, the sufficiency and receipt of which is acknowledged, OWNER and CONTRACTOR hereby agree as follows:

1. The term "CONTRACT DOCUMENTS" means and includes the following, all of which are incorporated herein and made part of the CONTRACT:
 - A. Project Manual for "**Donax Water Reclamation Facility Post Hurricane Ian Repairs & Hardening**" dated November 17, 2025, including, without limitation, all General Specifications, General Conditions, Special Provisions, Required Contract Provisions, Technical Specifications, and Appendices
 - B. Bidding Documents, including Advertisement, Information to Bidders, and Addenda
 - C. Bid Drawings for "**Donax Water Reclamation Facility Post Hurricane Ian Repairs & Hardening**" dated November 2025.
 - D. CONTRACTOR'S Proposal in response to ITB-UT- 0-2026/BS
 - E. This CONTRACT
 - F. Performance and Payment Bond
 - G. Notice of Award
 - H. Notice to Proceed
 - I. Change Order(s)
2. The CONTRACTOR will commence and complete the construction which includes:

"Donax Water Reclamation Facility Post Hurricane Ian Repairs & Hardening" as described in the CONTRACT DOCUMENTS (the "WORK")
3. The CONTRACTOR will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the completion of the WORK.
4. The CONTRACTOR will commence the WORK within six calendar days after date of the NOTICE TO PROCEED and will complete the same with within **THREE HUNDRED TWENTY (320)** calendar days after notice to proceed, unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS.
5. The CONTRACTOR agrees to perform all of the WORK in accordance with the CONTRACT DOCUMENTS for the sum of \$_____ said amount being the total "unit price sum" as listed on the Contractor's proposal form as submitted for this project.
6. The OWNER will pay to the CONTRACTOR in the manner and at such times as set forth in the General Conditions such amounts as required by the CONTRACT DOCUMENTS.
7. The CONTRACT DOCUMENTS embody the entire agreement of CONTRACTOR and OWNER regarding the Work. No deviation from the CONTRACT DOCUMENTS will be allowed, honored or compensated unless accompanied by a fully executed change order.

8. This CONTRACT shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns; however, CONTRACTOR shall not assign or otherwise transfer its rights, duties or obligations under this CONTRACT without prior written consent of OWNER.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in counterparts each of which shall be deemed an original on the date first above written.

(SEAL)

OWNER City of Sanibel

ATTEST _____

By _____

Name _____

Name _____

Title _____

Title _____

(SEAL)

CONTRACTOR: _____

ATTEST _____

By _____

Name _____

Name _____

Title _____

Title _____

Email _____

Approved as to form

City Attorney

SPECIMEN FORM OF CONTRACT
PERFORMANCE AND PAYMENT BOND

BY THIS BOND, WE

(Name of Contractor)

(Address of Contractor)

A _____, as principal, and
(Corporation, Partnership, or Individual)

(Name of Surety)

(Address of Surety)

a Corporation, as Surety, are bound to

(Name of Owner)

(Address of Owner)

herein called Owner, in the sum of _____
_____ Dollars, (\$_____)

for payment of which we bind ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally.

THE CONDITION OF THIS BOND is that if Principal:

1. Performs the Contract dated _____, **"Year"** between Principal and Owner for construction of:

the contract being made a part of this bond by reference, at the times and in the manner prescribed in the contract and;

2. Promptly makes payments to call claimants, as defined in Section 255.05 (1), Florida Statutes, supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal in the prosecution of the work provided for in the Contract and;
3. Pays Owner all losses, damages, expenses, costs, and attorney's fees, including appellate proceedings, that Owner sustains because of a default by Principal under the Contract and;
4. Performs the guarantee of all work and materials furnished under the Contract for the time specified in the Contract; then this bond is void; otherwise it remains in full force.

Any changes in or under the Contract Documents and compliance or non-compliance with any formalities connected with the Contract or the changes does not affect Surety's obligation under this bond.

DATED ON _____, **"Year"**.

ATTEST:

(Principal) Secretary

Principal

By _____

(SEAL)

(Witness as to Principal)

(Address)

ATTEST:

(Surety) Secretary

Surety

By _____
Attorney-in-Fact

(SEAL)

(Witness as to Surety)

(Address)

(Address)

NOTE: Date of bond must not be prior to date of Contract. If Contractor is Partnership, all partners should execute Bond.

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.

PERIODIC ESTIMATE FOR PARTIAL PAYMENT

PROJECT: _____ OWNER: _____

ENGINEER: _____ CONTRACTOR: _____

PERIODIC ESTIMATE NO. _____ FOR PERIOD _____ TO _____

ANALYSIS OF ADJUSTED CONTRACT AMOUNT TO DATE

- A. Original contract amount (Col.6) _____
- B. Plus: Change Order Additions (Col.13) _____
- C. Less: Change Order Deductions (Col.16) _____
- D. Adjust contract amount to date _____

ANALYSIS OF WORK PERFORMED

- 1. Amount of original contract work performed to date (Col.8) _____
- 2. Change Order work performed to date _____
- 3. Total amount of work performed to date _____
- 4. Add: Materials stored at close of this period
(Attach detailed schedule _____)
- 5. Less: Amount retained _____ percent _____
- 6. Net amount earned on contract work to date _____
- 7. Less: Amount of previous payments _____
- 8. Balance due this payment _____

CERTIFICATION OF CONTRACTOR

According to the best of my knowledge and belief, I certify that all items and amounts shown on the face of this periodic estimate are correct; that all work has been performed and/or material supplied in full accordance with the Terms and Conditions of the Contract, and/or duly authorized deviations, substitutions, alterations, and/or additions; that this estimate is as true and correct statement of the contract account up to and including the last day of the period covered by this Periodic Estimate, and that no part of the "Balance Due This Payment" has been received:

(Contractor)

By _____
(Authorized Representative)

Title _____

RECOMMENDATION OF ENGINEER

In accordance with the contract and this Periodic Estimate for Partial Payment, the Contractor is entitled to payment in the amount shown above.

DATE: _____

By _____

PERIODIC ESTIMATE FOR PARTIAL PAYMENT

PROJECT:

OWNER:

ENGINEER:

CONTRACTOR:

PERIODIC ESTIMATE NO. _____ FOR PERIOD _____ TO _____

CONTRACT AMOUNT						COMPLETED TO DATE		
ITEM NO.	DESCRIPTION OF ITEM	QUANTITY	UNIT OF MEAS.	COST PER UNIT	TOTAL AMOUNT	QUANTITY	AMOUNT	% COM- LETE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

TOTAL

PERIODIC ESTIMATE FOR PARTIAL PAYMENT

PROJECT:

OWNER:

ENGINEER:

CONTRACTOR:

PERIODIC ESTIMATE NO. _____ FOR PERIOD _____ TO _____

SCHEDULE OF CHANGE ORDERS

CHANGE ORDER					ADDITIONS	
					AMOUNT COMPLETED TO DATE	DEDUCTIONS
NO. (10)	DATE (11)	DESCRIPTION (12)	AMOUNT (13)	PERCENT COMPLETE (14)	(15)	(16)

TOTAL

CONTRACTOR'S LETTERHEAD

CONTRACTOR'S CERTIFICATE

I, _____, the duly qualified, acting and authorized agent of the Contractor, _____ on the project, do hereby certify that we have performed all of the work set forth in strict accordance with the plans, specifications, laws and ordinances applicable thereto and do further certify that all materials and equipment listed herein have been paid for in full as allowed on all prior Estimates and, if requested to do so, will show evidence of payment for same in writing before the final payment of this Estimate No. _____.

I further certify (if this is a Final Estimate) that the amount received hereunder is considered compensation and final payment in full for all work performed under the Contract, including any amendments thereto, and upon payment of said sum, hereby release the Owner, its employees, agents, and representatives in accordance with said Contract. We further certify that we fully guarantee all work performed hereunder for a period of twelve months from the date of payment for the Final Estimate, (in accordance with the terms of our original Contract and all Amendments thereto), during which time all terms and conditions of the original Contract Documents shall remain in full force and effect, including the insurance requirements, Hold Harmless Agreement and Indemnifying Agreements as contained in said Contract Documents.

CERTIFIED TO FOR PAYMENT ON THIS _____ DAY OF _____, "Year".

CONTRACTOR'S SEAL

Contractor

BY: _____

TITLE: _____

Sworn to before me this _____ day of _____, "Year".

NOTARY

My commission expires: _____:

(NOTARY SEAL)

PROJECT: _____

OWNER: City of Sanibel

CHANGE ORDER NO. _____

TO: _____

You are hereby authorized to make the following additions and/or deductions to your contract amount.

	PREVIOUS CONTRACT AMOUNT	NET CHANGE		REVISED		CONTRACT AMOUNT
		INCREASE	DECREASE	(DEDUCT)	(ADD)	
TOTAL:	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____

Description of Change: Add Deduct

RECOMMENDED:

APPROVED:

OWNER _____

By _____ By _____

Title _____ Date _____ Title _____ Date _____

ACCEPTED:

CONTRACTOR _____

BY _____

Title _____ Date _____

GENERAL CONDITIONS OF THE CONTRACT

SECTION 2.1 - CONTRACT DOCUMENTS

2.1.01 GENERAL:

The Contract Documents comprise the following general classifications of documents, including all additions, deletions, modifications, or other documents incorporated therein:

1. Bidding Documents
2. Contract
3. General Conditions of the Contract
4. Special Conditions
5. Specifications

2.1.02 BIDDING DOCUMENTS:

The Bidding Documents are issued by the OWNER to assist bidders in preparing their proposal include:

1. Advertisement
2. Information for Bidders
3. Proposal: The offer of a Bidder to perform the work described by the Contract Documents made out and submitted on the prescribed Proposal Form, properly signed and guaranteed.
4. Addenda to Contract Documents: Any addenda issued during the time of bidding, or forming a part of the Contract Documents loaned to the Bidder for the preparation of his Proposal, shall be covered in the Proposal, and shall be made a part of the Contract. Receipt of each Addendum shall be acknowledged in the Proposal.

2.1.03 CONTRACT:

The Contract defines the "Contract Documents" and covers the performance of the work described in the Contract Documents including all supplemental addenda thereto and all general and special provisions pertaining to the work or materials.

2.1.04 GENERAL CONDITIONS OF THE CONTRACT:

The General Conditions of the Contract outline certain general responsibilities of the OWNER and the CONTRACTOR (who are the parties to the Contract) and those responsibilities delegated by the OWNER to the Engineer who acts as the agent of the OWNER.

1. Definitions: Wherever the words hereinafter defined, or pronouns used in their stead, occur in these specifications and contract documents, they shall have the meanings herein given:
 - A. The word "OWNER" shall mean the municipality, person, firm, or corporation as specified in the Advertisement for Bids, for whom the work is to be done.

- B. The word "CONTRACTOR" shall mean the person, firm, or corporation entering into a contract with the OWNER to construct and complete the work as herein specified, set out and shown.
- C. The word "sub-contractor" shall mean a person, firm, or corporation, other than a CONTRACTOR, supplying labor and materials or labor for work at the site of the project.
- D. The word "Engineer" shall mean the project engineer as designated by the OWNER.

2.1.05 SPECIAL CONDITIONS:

Special Conditions are special provisions not included in the General Conditions of the Contract, which apply to this specific project.

2.1.06 DRAWINGS AND SPECIFICATIONS:

The intent of the Drawings and Specifications is that the CONTRACTOR shall furnish all labor, materials, equipment, and transportation necessary for the proper execution of the work, unless specifically noted otherwise. The CONTRACTOR shall do all the work outlined in the Contract Documents and all incidental work necessary to complete the project in a substantial and acceptable manner, and fully complete the work or improvement, operational and ready for occupancy by the OWNER.

1. Discrepancies: Any discrepancies found between the Drawings and Specifications and site conditions or any inconsistencies or ambiguities in the Drawings and Specifications shall be immediately reported to the Engineer, who shall promptly correct such inconsistencies or ambiguities in writing. Any work done by the CONTRACTOR after his discovery of such discrepancies, inconsistencies, or ambiguities shall be done at the CONTRACTOR'S risk.
2. Adequacy: Responsibility for adequacy of the design and for sufficiency of the Drawings and Specifications shall be borne by the OWNER. The complete requirements of the work to be performed under the Contract shall be set forth in Drawings and Specifications to be supplied by the OWNER through the Engineer or by the Engineer as representative of the OWNER. The Drawings and Specifications shall be considered inseparable documents; and in considering them, the CONTRACTOR shall rely upon both instruments in order to perform the work in accordance with their combined intent.
3. Additional Instructions: Further instructions may be issued by the Engineer during the progress of the work by means of Drawings, or otherwise to make more clear or specific the Drawings and Specifications or as may be necessary to explain or illustrate changes in the work to be done. Where said correction of errors or omissions, except as provided in the next two paragraphs below, adds to the amount of work to be done by the CONTRACTOR, compensation for said additional work shall be made under the item for Extra Work except where the additional work may be classed under some item of work for which a unit price is included in the proposal.
4. The fact that specific mention of the fixture, or of any part of work, is omitted in the specifications, whether intentionally or otherwise, when the same is clearly shown or indicated on the drawings, or is usually and customarily required to fully complete such work as is specified herein, will not entitle the CONTRACTOR to consideration in the matter

of any claim for extra compensation, but the said fixtures or work or both must be installed or done the same as if called for by both drawings and specifications.

5. All work indicated on the drawings and not mentioned in the specifications or vice versa, and all work and material usual and necessary to make work complete in all its parts, whether or not they are indicated on the drawings or mentioned in the specifications, shall be furnished and executed the same as if they were called for by both the drawings and specifications.
6. Plans and Specifications: The Engineer may furnish the CONTRACTOR up to 5 sets of plans and specifications covering this project at no cost to the CONTRACTOR. For each set of plans and specifications furnished to the CONTRACTOR, or any of his sub-contractor's, in excess of this number, the CONTRACTOR shall be billed at actual cost of printing and delivery.
7. Dimensions: Only figured dimensions on the Drawings will be used by the CONTRACTOR. Where the work of the CONTRACTOR is affected by finish dimensions, these shall be determined by the CONTRACTOR at the site, and he shall assume the responsibility, therefore.

2.1.07 CONTRACT DOCUMENTS FOR THE USE OF THE ENGINEER:

The CONTRACTOR shall maintain one complete set of the Contract Documents at the job site which shall always be available to the Engineer and upon which the CONTRACTOR shall record all changes and field adjustments. The CONTRACTOR shall keep one copy of plans, shop drawings, and supplemental drawings at the site in good order and annotated to show all changes made during construction. An as-built survey of the project shall be performed and submitted to OWNER prior to final acceptance. The survey shall be conducted in accordance with the standards set forth in Chapter 472 of the Florida Statutes and the Minimum Technical Standards for such survey as specified in Chapter 61G17 of the Florida Administrative Code. The cost of the survey shall be borne by the CONTRACTOR.

SECTION 2.2 - OWNER-CONTRACTOR-ENGINEER RELATIONS

2.2.01 OWNER'S RIGHTS AND RESPONSIBILITIES:

1. Lands by OWNER: The OWNER will provide the lands shown on the Drawings or described in the Specifications upon which the work under the Contract is to be performed and to be used for right-of-way for access. Any delay in furnishing these lands by the OWNER will be deemed proper for adjustment in the Contract Amount and in the time of completion.
2. Base Lines and Bench Marks: Unless otherwise specified, the OWNER will establish base lines, and bench marks.
3. OWNER'S Right to Correct Deficiencies: Upon failure to perform the work in accordance with the Contract Documents, including any requirements with respect to the Schedule of Completion, and after five days' written notice to the CONTRACTOR, the OWNER may, without prejudice to any other remedy he may have, correct such deficiencies in work intended to become a permanent part of the project. The cost to correct such deficiencies may be deducted from the payment due the CONTRACTOR.

4. Suspension of Work by OWNER: The OWNER shall have the authority to suspend the work, wholly or in part, for such period or periods as he may deem necessary due to unsuitable weather or such other conditions as are considered unfavorable to carry out the provisions of the Contract, or to supply materials meeting the requirements of the Contract Documents.
 - A. Notice: The work or any portion thereof may be suspended at any time by the OWNER provided that he gives the CONTRACTOR five days' notice of suspension which shall set forth the date on which work is to be resumed. The CONTRACTOR shall resume the work upon written notice from the OWNER and within ten days after the date set forth in the notice of suspension. If the OWNER does not give written notice to resume work within ten days of the date fixed in the notice of suspension, the CONTRACTOR may abandon that portion of the work so suspended and shall be entitled to payment in accordance with Paragraph 2.6.09, Payment for Work Suspended by the OWNER.
 - B. In case of any suspensions, the time in which the CONTRACTOR is required to complete the work shall be extended as many working days as the same is suspended; provided, however, that if the work is suspended on account of failure on the part of the CONTRACTOR to comply with specifications, such extensions of time will not be allowed.
5. OWNER'S Right to Terminate Agreement and Complete the Work: The OWNER shall have the right to terminate his agreement with the CONTRACTOR after giving ten days' written notice of termination to the CONTRACTOR in the event of any default by the CONTRACTOR.
 - A. Default by CONTRACTOR: It shall be considered a default by the CONTRACTOR whenever he shall:
 - (i) Declare bankruptcy, become insolvent, or assign his assets for the benefit of his creditors.
 - (ii) Disregard or violate provisions of the Contract Documents or fail to prosecute the work according to the agreed Schedule of Completion, including extensions thereof.
 - (iii) Fail to provide a qualified superintendent, competent workmen or sub-contractor's, or proper materials, or fail to make prompt payment, therefore.
 - B. Completion by the OWNER: In the event of termination of the Agreement by the OWNER because of default by the CONTRACTOR, the OWNER may take possession of the work and of all materials and equipment thereon and may finish the work by whatever method and means he may select.

2.2.02 CONTRACTOR'S RIGHTS AND RESPONSIBILITIES:

All work shall be done in strict accordance with the Contract Documents. Observations, construction reviews, tests, recommendations or approvals by the Engineer or persons other than the CONTRACTOR, shall in no way relieve the CONTRACTOR of his obligation to complete all work in accordance with the Contract Documents. All work shall be done under the direct supervision of the

CONTRACTOR. The CONTRACTOR shall be responsible for construction means, methods, techniques and procedures, and for providing a safe place for the performance of the work by the CONTRACTOR, Sub-contractor's, suppliers and their employees, and for access use, work or occupancy by all authorized persons. The CONTRACTOR shall be responsible for all obligations prescribed as employer obligations under Chapter XVII of Title 29, Code of Federal Regulations, Part 1926, otherwise known as "Safety and Health Regulations for Construction".

1. Lands by CONTRACTOR: Any land and access thereto not specifically shown to be furnished by the OWNER that may be required for temporary construction facilities or for storage of materials shall be provided by the CONTRACTOR with no liability to the OWNER. The CONTRACTOR shall confine his apparatus and storage to such additional areas as he may provide at his expense.
 - A. Private and Public Property: The CONTRACTOR shall not enter upon private property for any purpose without obtaining permission; and he shall be responsible for the preservation of all public property, trees, monuments, structures, and improvements, along and adjacent to the street and/or right-of-way and shall use every precaution necessary to prevent damage or injury thereto. He shall use suitable precautions to prevent damage to pipes, conduits, and other underground structures, and shall protect carefully from disturbance or damage all monuments and property marks until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed.
2. Surveys: Based upon the information provided by the OWNER, the CONTRACTOR shall develop and make all detailed surveys necessary for construction, including slope stakes, batter boards, stakes for pile locations and other working point lines, and elevations. The CONTRACTOR shall carefully preserve bench marks, reference points and stakes; and, in the case of destruction thereof by the CONTRACTOR or resulting from his negligence, the CONTRACTOR shall be charged with the expense and damage resulting there from and shall be responsible for any mistakes that may be caused by the loss or disturbance of such bench marks, reference points, and stakes.
3. Public Utilities: The elevation and location of all public utilities shown on the Drawings were taken from existing public records. It shall be the duty of the CONTRACTOR to make final and exact determination of the location and extent of all utilities, and he will be liable for any expense resulting from damage to them.
4. Superintendent: A qualified superintendent, who is acceptable to the OWNER, shall be maintained on the work and give efficient supervision to the work until its completion. The superintendent shall have full authority to act in behalf of the CONTRACTOR, and all instruction given to the superintendent shall be considered as given to the CONTRACTOR. It shall be the responsibility of this CONTRACTOR's superintendent to coordinate the work of all the sub-contractor's. The superintendent shall be present on the site at all times required to perform adequate supervision and coordination.
5. Subcontracts: At the time set forth in the Contract Documents or when requested by the OWNER, the CONTRACTOR shall submit in writing for review of the OWNER the names of the sub-contractor's proposed for the work. Sub-contractor's may not be changed, except at the request or with the approval of the OWNER. The CONTRACTOR is responsible to the OWNER for the acts and deficiencies of his sub-contractor's, and of their direct and indirect employees, to the same extent as he is responsible for the acts and deficiencies of his employees. The Contract Documents shall not be construed as creating

any contractual relation between any sub-contractor and the OWNER. The CONTRACTOR shall bind every sub-contractor by the terms of the Contract Documents.

A. For convenience of reference and to facilitate the letting of Contracts and Subcontracts, the Specifications are separated into titled sections. Such separation shall not, however, operate to make the OWNER or the Engineer an arbiter to establish limits to the contracts between CONTRACTOR and sub-contractor.

6. CONTRACTOR'S Right to Suspend Work or Terminate Agreement: CONTRACTOR may suspend work or terminate his Agreement with the OWNER upon ten days' written notice to the OWNER for any of the following reasons:

A. If an order of any court or other public authority caused the work to be stopped or suspended for a period of 90 days through no act or fault of the CONTRACTOR or his employees.

B. If the OWNER should fail to pay the CONTRACTOR any sum within 45 days after its award by arbitrators.

7. Work During an Emergency: The CONTRACTOR shall perform any work and shall furnish and install any materials and equipment necessary during an emergency endangering life or property. In all cases, he shall notify the OWNER of the emergency as soon as practicable, but he shall not wait for instruction before proceeding to properly protect both life and property.

2.2.03 RESPONSIBILITY OF THE ENGINEER:

The Engineer shall decide questions which may arise as to the quality and acceptability of materials furnished, work performed, rate of progress of work, interpretation of Drawings and Specifications, and all questions as to the acceptable fulfillment of the Agreement on the part of the CONTRACTOR. The duties and responsibilities of the Engineer as set forth herein shall not be extended, except through written consent of the Engineer and the OWNER.

1. Observation of the Work: All materials and each part or detail of the work shall always be subject to observation by the Engineer and the OWNER; and the CONTRACTOR will be held strictly to the intent of the Contract Documents in regard to quality of materials, workmanship, and the diligent execution of the Contract. Observations may be made at the site or at the source of material supply, whether mill, plant, or shop. The Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the CONTRACTOR as is required to make his observations and construction review.

2. Acceptability of Work: The Engineer's decision as to the acceptability or adequacy of the work shall be final and binding upon the CONTRACTOR. The CONTRACTOR agrees to abide by the Engineer's decision relative to the performance of the work.

3. Engineer's Decisions: All claims of the OWNER or the CONTRACTOR shall be presented to the Engineer for decision which shall be final, except in cases where time and/or financial considerations are involved, which shall be subject to arbitration.

2.2.04 ORAL AGREEMENTS:

No oral order, objection, claim, or notice by any party to the others shall affect or modify any of the terms or obligations contained in any of the Contract Documents; and none of the provisions of the Contract Documents shall be held to be waived or modified by reason of any act whatsoever, other than a definitely agreed waiver or modification thereof in writing; and no evidence shall be introduced in any proceeding of any other waiver or modification.

2.2.05 OBSERVATION OF COMPLETED WORK

The CONTRACTOR shall remove or uncover such portions of the completed work as may be directed by the OWNER at any time before acceptance of the work. After examination, the CONTRACTOR shall restore the work to the standard required by the Contract Documents. Should the work thus exposed or examined prove acceptable, the uncovering or removing and the restoring of the work shall be paid for as Extra Work; but should the work exposed or examined prove unacceptable, the uncovering, removing, and restoring of the work shall be at the CONTRACTOR'S expense.

2.2.06 WORK BY OWNER OR OTHER CONTRACTOR'S:

1. Separate Contracts: The OWNER may let other contracts in connection with the work of the CONTRACTOR. The CONTRACTOR shall cooperate with other CONTRACTOR'S regarding storage of materials and execution of their work. It shall be the CONTRACTOR'S responsibility to inspect all work by other CONTRACTOR'S affecting his work and to report to the OWNER any irregularities which will not permit him to complete his work in a satisfactory manner. His failure to notify the OWNER of such irregularities shall indicate the work of other CONTRACTOR'S has been satisfactorily completed to receive his work. The CONTRACTOR shall not be responsible for defects of which he could not have known, which develop in the work of others after the work is completed. It shall be the responsibility of the CONTRACTOR to measure the completed work in place and report to the OWNER immediately any difference between completed work by others and the provisions of the Contract Documents.
2. Written Agreement: Whenever work being done by the OWNER through his own employees or through other CONTRACTOR'S is contiguous to work covered by the Contract Documents, the respective rights of the various interests involved shall be established by written agreement to secure the completion of the various portions of the work in general harmony.

2.2.07 SECTION DELETED

2.2.08 NIGHT AND SUNDAY WORK:

No night or Sunday work requiring the presence of an Engineer or Inspector will be permitted, except in case of emergency and then only to such an extent as it is absolutely necessary and with written approval of the Engineer, provided that the clause shall not operate in case of a gang organized for regular and continuous night work, and on work which, in the opinion of the Engineer, can be performed satisfactorily at night or on Sunday.

SECTION 2.3 - MATERIALS, EQUIPMENT, AND WORKMANSHIP

2.3.01 MATERIALS AND EQUIPMENT:

The materials and equipment installed in the work shall meet the requirements of the Contract Documents, and no materials or equipment shall be ordered until reviewed by the Engineer. All materials and equipment not otherwise specifically indicated shall be furnished by the CONTRACTOR. The CONTRACTOR shall guarantee all materials and equipment he provides in accordance with Paragraph 2.3.08.

1. Substitutions: In order to establish standards of quality, the Engineer has, in the detailed Specifications, referred to certain products by name and catalog number. This procedure is not to be construed as eliminating from competition other products of equal or better quality by other manufacturers where fully suitable in design.
 - A. The CONTRACTOR shall furnish the complete list of proposed desired substitutions prior to signing of the Contract, together with such engineering and catalog data as the Engineer may require.
 - B. The CONTRACTOR shall abide by the Engineer's recommendation when proposed substitute materials or items of equipment are not recommended for installation and shall furnish the specified material or item of equipment in such case. All proposals for substitutions shall be submitted in writing by the General CONTRACTOR and not by individual trades or material suppliers. The Engineer will review proposed substitutions and make his recommendations in writing within a reasonable time.
2. Space Requirements: It shall be the responsibility of the CONTRACTOR to ensure that materials and equipment to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections and shall order such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the Contract Documents.
3. Arrangement: Where equipment requiring different arrangement of connections from those shown is approved, it shall be the responsibility of the CONTRACTOR to install the equipment to operate properly, and in harmony with the intent of the Contract Documents, and to make all changes in the work required by such arrangement.
4. Unacceptable Materials and Equipment: Materials and equipment which do not conform to the requirements of the Contract Documents, are not equal to samples reviewed by the Engineer, or are in any way unsatisfactory or unsuited to the purpose for which they are intended, shall not be furnished nor installed.
5. Storage: Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the work. When considered necessary, they shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground, and/or they shall be placed under cover. Stored materials and equipment shall be located to facilitate prompt inspection. Private property shall not be used for storage purposes without the written permission of the OWNER or lessee.

6. Manufacturer's Directions: Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the manufacturer.

2.3.02 SAMPLES:

All samples called for in the Specifications or required by the Engineer shall be furnished by the CONTRACTOR and shall be submitted to the Engineer for his review. Samples shall be furnished so as not to delay fabrication, allowing the Engineer reasonable time for the consideration of the samples submitted.

1. Samples for Tests: CONTRACTOR shall furnish such samples of material as may be required for examination and test. All samples of materials for tests shall be taken according to standard methods or as provided in the Contract Documents.
2. CONTRACTOR'S Guaranty: All samples shall be submitted by the CONTRACTOR with a covering letter indicating that such samples are recommended by the CONTRACTOR for the service intended and that the CONTRACTOR'S Guaranty will fully apply.
3. All materials, equipment, and workmanship shall be in accordance with samples guaranteed by the CONTRACTOR and reviewed by the Engineer.

2.3.03 SHOP DRAWINGS:

The CONTRACTOR shall provide shop drawings, setting schedules and such other drawings as may be necessary for the prosecution of the work in the shop and in the field as required by the Drawings, Specifications, or the Engineer's instructions. Deviations from the Drawings and Specifications shall be called to the attention of the Engineer at the time of the first submission of shop drawings and other drawings for consideration. The Engineer's review of any drawings shall not release the CONTRACTOR from responsibility for such deviations. Shop drawings shall be submitted according to a schedule prepared jointly by the CONTRACTOR and the Engineer.

1. CONTRACTOR'S Certification: When submitted for the Engineer's review, shop drawings shall bear the CONTRACTOR'S certification that he has reviewed, checked, and approved the shop drawings; that they are in harmony with the requirements of the Project and with the provisions of the Contract Documents; and that he has verified all field measurements and construction criteria, materials, catalog numbers, and similar data. CONTRACTOR shall also certify that the work represented by the shop drawings is recommended by the CONTRACTOR and the CONTRACTOR'S Guaranty will fully apply.

2.3.04 EQUIPMENT DATA:

The CONTRACTOR shall submit for the Engineer's review complete catalog data for every manufactured item of equipment and all components to be used in the work, including specific performance data, material description, rating, capacity, working pressure, material gage or thickness, brand name, catalog number, and general type. This submission shall be compiled by the CONTRACTOR and reviewed by the Engineer before any of the equipment is ordered.

1. Index: Each data sheet or catalog in the submission shall be indexed according to specification section and paragraph for each reference.

2. Relation to Contract Documents: Catalog data for equipment reviewed by the Engineer shall not supersede the Engineer's Contract Documents. The review of the Engineer shall not relieve the CONTRACTOR from responsibility for deviations from Drawings or Specifications, unless he has in writing called the Engineer's attention to such deviations at the time of submission, nor shall it relieve him from responsibility for error of any sort in the items submitted. The CONTRACTOR shall check the work described by the catalog data with the Engineer's Contract Documents for deviations and errors.
3. CONTRACTOR'S Certification: Equipment data shall be submitted by the CONTRACTOR with a covering letter indicating that he has reviewed, checked and approved the data submitted; that they are in harmony with the requirements of the project and with the provisions of the Contract Documents; and that he has verified all field measurements and construction criteria, materials, catalog numbers, and similar data. CONTRACTOR shall also certify that the work represented by the shop drawings is recommended by the CONTRACTOR and that his Guaranty will fully apply.

2.3.05 REJECTED WORK AND MATERIALS:

Any defective work whether the result of poor workmanship, use of defective materials, damage through carelessness or any other cause shall be removed within ten days after written notice is given by the OWNER, and the work shall be re-executed by the CONTRACTOR. The fact that the Engineer may have previously overlooked such defective work shall not constitute an acceptance of any part of it.

1. Should the CONTRACTOR fail to remove rejected work or materials within ten days after written notice to do so, the OWNER may remove them and may store the materials.
2. Correction of faulty work after final payment shall be in accordance with Paragraph 2.5.12.

2.3.06 CUTTING AND PATCHING:

The CONTRACTOR shall do all necessary cutting and patching of the work that may be required to properly receive the work of the various trades or as required by the Drawings and Specifications to complete the structure. He shall restore all such cut or patched work as approved by the Engineer. Cutting of existing structure that may endanger the work, adjacent property, workmen, or the public shall not be done.

2.3.07 CHARACTER OF WORKMEN:

The CONTRACTOR shall always be responsible for the conduct and discipline of his employees and/or any sub-contractor or persons employed by sub-contractor's. All workmen must have sufficient knowledge, skill, and experience to perform properly the work assigned to them. Any foreman or workman employed by the CONTRACTOR or sub-contractor who does not perform his work in a skillful manner or appears to be incompetent or to act in a disorderly or intemperate manner shall, at the written request of the OWNER, be discharged immediately and shall not be employed again in any portion of the work without the approval of the OWNER.

2.3.08 GUARANTY:

The CONTRACTOR shall guarantee all materials and equipment furnished and work performed for a period of one year from the date of written acceptance of the work.

1. Correction of faulty work after final payment shall be as provided in Paragraph 2.5.12.

2.3.09 A.S.T.M. DESIGNATION:

Wherever the letters "A.S.T.M." are used in these specifications, it shall be understood as referring to the American Society for Testing Materials. When reference is made to a certain Designation Number of a specification or test as set out or given by the American Society of Testing Materials, it shall be understood to mean the current, up-to-date standard specification or tentative specification for that particular process, material, or test as currently published by that group.

SECTION 2.4 – INSURANCE, LEGAL RESPONSIBILITY, AND SAFETY

2.4.01 INSURANCE:

CONTRACTOR shall purchase and maintain such comprehensive general liability and other insurance as well as 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 such performance is by CONTRACTOR, by any sub-contractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. All insurance policies shall be with insurers qualified to do business in the state of the Project location.

1. Types: The types of insurance the CONTRACTOR is required to obtain and maintain for the full period of the Contract will be: Workmen's Compensation and Employer's Liability, Comprehensive General Liability and Automobile Liability, U.S.L. & H. coverage (if applicable), Jones Act (if applicable) and an Excess Liability Umbrella Insurance as detailed in the following specifications.
2. Evidence: As evidence of specified insurance coverage, the OWNER may, in lieu of actual policies, accept a Certificate of Insurance on Accord Form 25 issued by the insurance carrier showing such policies in force for the specified period. Each policy or certificate will bear an endorsement or statement waiving right of cancellation or reduction in coverage without ten days notice in writing to be delivered by registered mail to the OWNER. Should any policy be canceled before final payment by the OWNER to the CONTRACTOR and the CONTRACTOR fails immediately to procure other insurance as specified, the OWNER reserves the right to procure such insurance and to deduct the cost thereof from any sum due the CONTRACTOR under this Contract.
3. Adequacy of Performance: Any insurance bearing on adequacy of performance shall be maintained after completion of the project for the full guaranty period. Should such insurance be canceled before the end of the guaranty period and the CONTRACTOR fails immediately to procure other insurance as specified, the OWNER reserves the right to procure such insurance and to charge the cost thereof to the CONTRACTOR.
4. Payment of Damages: Nothing contained in these insurance requirements is to be construed as limiting the extent of the CONTRACTOR'S responsibility for payment of damages resulting from his operations under this Contract.

2.4.02 COMPREHENSIVE GENERAL LIABILITY INSURANCE:

1. General liability insurance shall provide full comprehensive form coverage for both bodily injury and property damage. Such coverage shall include premises-operations, underground hazard, products/completed operations hazard, contractual insurance, broad

form property damage, independent CONTRACTOR'S, and personal injury. The limits for bodily injury shall be \$500,000 each occurrence and \$500,000 aggregate. The limits for property damage shall be \$100,000 each occurrence and \$100,000 aggregate.

2. Automobile liability insurance shall provide full comprehensive form coverage for both bodily injury and property damage. Such coverage shall include owned, hired, and non-owned vehicles. The limits for bodily injury shall be \$500,000 each person and \$500,000 each accident. The limits for property damage shall be \$100,000.
3. Excess liability insurance shall provide an umbrella form coverage for both bodily injury and property damage combined with a minimum limit of \$2,000,000.
4. Indemnity: Included in such insurance will be contractual coverage sufficiently broad to insure the OWNER, the Engineer, their consultants and each of their officers, agents, and employees as additional insured under the General Liability Policy. See Paragraph 2.4.05 below for provisions of Indemnity.

2.4.03 WORKMEN'S COMPENSATION INSURANCE:

CONTRACTOR'S shall provide the statutory Workmen's Compensation and Employer's Liability Insurance requirements of the most current and applicable state Workmen's Compensation Insurance Laws.

2.4.04 DELETED

2.4.05 INDEMNITY:

The CONTRACTOR (sub-contractor) hereinafter "Indemnitor", hereby agrees to indemnify, save and hold harmless, and defend at its own expense the Engineer, OWNER, their respective partners, agents, employees, and anyone else acting for or on behalf of any of them, and any other person or entity for whom any of them may be legally responsible (herein collectively called "Indemnities") from all claims, losses, damages, suits, costs and expenses, including attorneys' fees, or actions of any nature whatsoever which arise out of or are connected with, or are alleged to arise out of or be connected with, the Work to be performed herein; including without limiting the generality of the foregoing, all liability for damages, loss, claims, demands, and actions arising or alleged to arise from injury including death, damage to property including the loss of use thereof and consequential damages therefrom, or damages arising out of economic loss, to any person or entity including any Indemnatee or Indemnitor or its employees, servants and agents whether based upon, or claimed to be based upon, statutory (including without limiting the generality of the foregoing, workmen's compensation), contractual, tort or other liability of any Indemnatee whether or not caused, or alleged to be caused, in whole or in part, by the joint, several or sole negligence, breach of contract, breach of warranty, strict liability, or other breach of duty by any Indemnatee, its partners, employees, agents, and anyone else for or on behalf of any of them, or any other person for whom any Indemnatee may be responsible.

In the event more than one Indemnitor is responsible or alleged to be responsible in respect to an accident or occurrence covered by this indemnification, then all of such Indemnitor shall be jointly and severally responsible to the Indemnities for indemnification shall be settled by separate proceedings and without jeopardy to any Indemnatee.

The indemnity provided hereunder shall not include indemnification of the Engineer in respect to claims arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs, or specifications, or (2) the giving of or the failure to give directions or instructions by

the Engineer, his agents or employees; provided that such giving or failure to give is a primary cause of the injuries and damages.

If any part of these indemnity provisions is adjudged to be contrary to law, the remaining parts of these provisions shall in all other respects be and remain legally effective and binding. Moreover, these indemnity provisions shall not be construed to eliminate or in any way reduce any other indemnification or right which the Engineer and OWNER has by law.

2.4.06 WAIVER OF SUBROGATION:

The OWNER and the CONTRACTOR waive all rights against (1) each other and other sub-contractor's, agents, and employees of each other, and (2) the Engineer and separate CONTRACTOR'S, if any, and their sub-contractor's, agents, and employees, for damages caused by fire or other perils to the extent covered by insurance obtained pursuant to this Section 2.4 or any other property insurance applicable to the work, except such rights as they may have to the proceeds of such insurance held by the OWNER as trustees. The OWNER or the CONTRACTOR, as appropriate, shall require of the Engineer, separate CONTRACTOR'S and sub-contractor's by appropriate agreements, written where legally required for validity, similar waivers each in favor of all other parties enumerated in this subparagraph 2.4.06.

2.4.07 PATENTS AND ROYALTIES:

If any design, device, material, or process covered by letters, patent or copyright is used by the CONTRACTOR, he shall provide for such use by legal agreement with the OWNER of the patent or a duly authorized licensee of such OWNER, and shall save harmless the OWNER and the Engineer from any and all loss or expense on account thereof, including its use by the OWNER.

2.4.08 PERMITS:

All permits and licenses (except as listed hereafter) necessary for the prosecution of the work shall be secured and paid for by the CONTRACTOR. The permits for construction within or across the property, rights-of-way, or easements of highways, railroads, gas lines, electric power transmission lines, water lines, telephone lines, telegraph lines, levees, or other utilities shall be secured and paid for by the OWNER. City of Sanibel Building Dept. permit fees shall be paid for by the OWNER.

2.4.09 LAWS TO BE OBSERVED:

The CONTRACTOR shall give all notices and comply with all Federal, State, and local laws, ordinances, and regulations in any manner affecting the conduct of the work, and all such orders and decrees as exist, or may be enacted by bodies or tribunals having any jurisdiction or authority over the work, and shall indemnify and save harmless the OWNER and the Engineer against any claim or liability arising from, or based on, the violation of any such law, ordinance, regulation, order or decree, whether by himself or his employees. If any discrepancy or inconsistency is discovered in the plans, drawings, specifications, or contract for this work in relation to any such law, ordinance, regulations, order or decree, the CONTRACTOR shall forthwith report the same to the Engineer in writing.

1. Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein; and the contract shall be read and enforced as though it were included herein and, if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the contract shall forthwith be physically amended to make such insertion. This shall include but not be limited to the Occupational Safety and Health Act of 1970.

2.4.10 WRITTEN NOTICE:

Written notice shall be considered as served when delivered in person or sent by registered mail to the individual, firm, or corporation, or to the last business address of such known to him who serves the notice.

1. Change of Address: It shall be the duty of each party to advise the other parties to the Contract as to any change in his business address until completion of the Contract.

2.4.11 ASSIGNMENT OF CONTRACT:

Neither the CONTRACTOR nor the OWNER shall sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or of his right, title, or interest therein, or his obligations thereunder, without written consent of the other party.

2.4.12 ORAL AGREEMENTS:

No oral order, objection, claim, or notice by any party to the others shall affect or modify any of the terms or obligations contained in any of the Contract Documents; and none of the provisions of the Contract Documents shall be held to be waived or modified by reason of any act whatsoever, other than by a definitely agreed waiver or modification thereof in writing, and no evidence shall be introduced in any proceeding of any other waiver or modification.

2.4.13 WORK DURING AN EMERGENCY:

The CONTRACTOR shall perform any work and shall furnish and install any materials and equipment necessary during an emergency endangering life or property. In all cases he shall not wait for instructions before proceeding to properly protect both life and property.

2.4.14 WARNING SIGNS AND BARRICADES:

The CONTRACTOR shall provide adequate signs, barricades, warning lights, and watchmen and take all necessary precautions for the protection of the work and the safety of the public. All barricades and obstructions shall be protected at night by suitable signal lights which shall be kept burning from sunset to sunrise. Barricades shall be of substantial construction and shall be painted such as to increase their visibility at night. Suitable warning signs shall be so placed and illuminated at night as to show in advance where construction, barricades, or detours exist.

2.4.15 PUBLIC CONVENIENCE:

The CONTRACTOR shall at all times so conduct his work as to insure the least possible obstruction to traffic and inconvenience to the general public and the residents in the vicinity of the work, and to insure the protection of persons and property. No road or street shall be closed to the public, except with the permission of the proper authorities. Fire hydrants on or adjacent to the work shall always be kept accessible to fire-fighting equipment. Temporary provisions shall be made by the CONTRACTOR to ensure the use of sidewalks and the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches, which shall not be obstructed.

2.4.16 SAFETY:

In accordance with general accepted construction practices, the CONTRACTOR shall be solely and completely responsible for conditions of the job site, including safety of all persons and property affected

directly or indirectly by his operations during the performance of the work. This requirement will apply continuously 24 hours per day until acceptance of the work by the OWNER and shall not be limited to normal working hours.

1. The duty of the Engineer to conduct construction review of the CONTRACTOR'S performance is not intended to include review of the adequacy of the CONTRACTOR'S safety measures in, on, or near the construction site.

2.4.17 EXISTING CONSTRUCTION:

When new construction is adjacent to or crosses highways, railroads, streets, or utilities under the jurisdiction of State, County, City, or other public agency, public utility, or private entity, the OWNER shall secure written permission from the proper authority before executing such new construction. The CONTRACTOR shall satisfy himself that the OWNER has secured written permission before any work is done. The CONTRACTOR shall acquaint himself with and shall execute the work in accordance with any and all requirements of the written permit. The CONTRACTOR shall replace or repair all existing construction damaged in the execution of this Contract. The CONTRACTOR will be required to furnish a release from the proper authority before final acceptance of the work.

2.4.18 SANITARY PROVISIONS:

The CONTRACTOR shall provide and maintain such sanitary accommodations for the use of his employees and those of his sub-contractor's as may be necessary to comply with the requirements and regulations of the local and state departments of health.

2.4.19 NONDISCRIMINATION IN EMPLOYMENT:

The CONTRACTOR agrees:

1. That in the hiring of employees for the performance of work under this contract or any subcontract hereunder, no CONTRACTOR, or sub-contractor, shall, by reason of race, religion, color, sex, national origin or ancestry, discriminate against any citizen who is qualified and available to perform the work to which the employment relates;
2. That no CONTRACTOR, sub-contractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, religion, color, sex, national origin or ancestry;
3. The CONTRACTOR agrees to comply with any Federal, State, or local law with respect to nondiscrimination in employment.

SECTION 2.5 - PROGRESS AND COMPLETION OF WORK

2.5.01 NOTICE TO PROCEED:

Following the execution of the Contract by the OWNER and the CONTRACTOR, written Notice to Proceed with work shall be given by the OWNER to the CONTRACTOR. The CONTRACTOR shall begin and shall prosecute the work regularly and uninterruptedly thereafter and not before (except as provided for herein) with such force as to secure the completion of the work within the Contract Time.

2.5.02 CONTRACT TIME:

The CONTRACTOR shall complete, in an acceptable manner, all of the work contracted for in the time stated herein. Computation of Contract Time shall commence on the day specified in the Notice to Proceed and every calendar day following, except as herein provided, shall be counted as Contract Time.

2.5.03 SCHEDULE OF COMPLETION:

The CONTRACTOR shall submit, at such times as may reasonably be requested by the Engineer, schedules showing the order in which the CONTRACTOR proposes to carry on the work, with dates at which the CONTRACTOR will start the various parts of the work, and estimated date of completion of each part.

2.5.04 CHANGES IN THE WORK:

The OWNER may, as the need arises, order changes in the work through additions, deletions, or modifications to the extent of 25% of the original Contract Amount, without invalidating the Contract. Compensation and time of completion affected by the change shall be adjusted at the time of ordering such change.

2.5.05 EXTRA WORK:

New and unforeseen items of work found to be necessary and which cannot be covered by any item or combination of items for which there is a Contract price, shall be classed as Extra Work. The CONTRACTOR shall do such Extra Work and furnish such materials as may be required for the proper completion or construction of the whole work contemplated, upon written order from the OWNER as approved by the Engineer. In the absence of such written order, no claim for Extra Work shall be considered. Extra Work shall be performed in accordance with these Contract Documents where applicable and work not covered by such shall be done in accordance with the best construction practice and in a workmanlike manner. Extra Work required in an emergency to protect life and property shall be performed by the CONTRACTOR as required.

2.5.06 EXTENSION OF CONTRACT TIME:

A delay beyond the CONTRACTOR'S control occasioned by an Act of God, by act or omission on the part of the OWNER, or by strikes, lockouts, fire, etc., may entitle the CONTRACTOR to an extension of time in which to complete the work as agreed by the OWNER, provided, however, that the CONTRACTOR shall immediately give written notice to the OWNER of the cause of such delay.

1. Act of God shall mean an earthquake, flood, cyclone, or other cataclysmic phenomenon of nature. Rain, wind, flood, or other natural phenomenon of normal intensity for the locality shall not be construed as an Act of God, and no reparation shall be made to the CONTRACTOR for damages to the work resulting therefrom.

2.5.07 USE OF COMPLETED PORTIONS:

The OWNER shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding that the time for completing the entire work or such portions may not have expired; but such taking possession and use shall not be deemed an acceptance of any work not completed in accordance with the Contract Documents. If such prior use increases the cost of or delays the completion of uncompleted work or causes refinishing of completed work, the

CONTRACTOR shall be entitled to such extra compensation or extension of time or both, as agreed by the OWNER.

2.5.08 REMOVAL OF CONSTRUCTION EQUIPMENT, TOOLS, AND SUPPLIES:

At the termination of this Contract, before acceptance of the work by the OWNER, the CONTRACTOR shall remove all of his equipment, tools, and supplies from the property of the OWNER. Should the CONTRACTOR fail to remove such equipment, tools, and supplies, the OWNER shall have the right to remove them at the expense of the CONTRACTOR.

2.5.09 CLEANING UP:

The CONTRACTOR shall remove from the OWNER'S property, and from all public and private property, all temporary structures, rubbish, and waste materials resulting from his operation or caused by his employees, and shall remove all surplus materials leaving the site smooth, clean, and true to line and grade.

2.5.10 ENGINEER'S CERTIFICATE OF SUBSTANTIAL COMPLETION:

When the work to be performed under this Contract is substantially completed in accordance with the Contract Documents, the Engineer shall prepare an Engineer's Certificate of Substantial Completion to be acknowledged and accepted by the OWNER and the CONTRACTOR. The Certificate may list items to be completed or corrected, but such Certificate shall not relieve the CONTRACTOR of his obligation to complete all work, whether listed or not, in accordance with the Contract Documents nor will it preclude any right the OWNER may have for recourse in accordance with the Contract Documents.

2.5.11 TERMINATION OF CONTRACTOR'S RESPONSIBILITY:

The Contract will be considered complete when all work has been finished, the final review made up by the Engineer, and the project accepted in writing by the OWNER. The CONTRACTOR'S responsibility shall then cease, except as set forth in his Performance and Payment Bond, as provided in Paragraph 2.3.08 Guaranty, and as provided in Paragraph 2.5.12 Correction of Faulty Work After Final Payment.

2.5.12 CORRECTION OF FAULTY WORK AFTER FINAL PAYMENT:

The making of the final payment by the OWNER to the CONTRACTOR shall not relieve the CONTRACTOR of responsibility for faulty materials or workmanship. The CONTRACTOR shall promptly replace any such defects discovered within one year from the date of written acceptance of the work.

2.5.13 LIQUIDATED DAMAGES:

In the event the CONTRACTOR fails to complete satisfactorily the entire work contemplated and provided for under this contract on or before the date of completion determined as described elsewhere herein, the OWNER shall deduct from the monies due to CONTRACTOR the sum of One Thousand Five Hundred Dollars (\$1,500.00) for each calendar day of delay, which sum is agreed upon not as a penalty but as a fixed and liquidated damage for each day of such delay, to be paid in full and subject to no deduction, it being understood and agreed that the time of completion is of the essence. If the monies due the CONTRACTOR are less than the amount of such liquidated damages, then the CONTRACTOR shall pay the balance to the OWNER.

2.5.14 INCENTIVE CLAUSE:

The City of Sanibel will pay the CONTRACTOR an "Incentive Bonus" in the sum of One Hundred Dollars (\$100.00) for each calendar day if the work in the Contract is completed in accordance with the Contract Documents, as determined by the Engineer, before the documented project completion date.

The parties anticipate that delays may be caused by or arise from any number of events during the course of the Contract, including, but not limited to, work performed, work deleted, change orders, supplemental agreements, delays, disruptions, differing site conditions, utility conflicts, design changes or defects, time extensions, extra work, right-of-way issues, permitting issues, actions of Suppliers, sub-contractor's or other CONTRACTOR'S, actions by third parties, shop drawing approval process delays, expansion of the physical limits of the project to make it functional, weather, weekends, holidays, suspension of CONTRACTOR'S operations, or other such events, forces or factors sometimes experienced in construction work. Such delays or events and their potential impacts on performance by the CONTRACTOR are specifically contemplated and acknowledged by the parties in entering into this Contract and shall not extend the "Incentive Bonus" Completion Date set forth above.

SECTION 2.6 – PAYMENTS TO CONTRACTOR

2.6.01 DETAILED BREAKDOWN OF CONTRACT AMOUNT:

Except in cases where unit prices form the basis for payment under the Contract, the CONTRACTOR shall, within ten days of receipt of Notice to Proceed, submit a complete breakdown of the Contract Amount showing the value assigned to each part of the work, including an allowance for profit and overhead. Upon approval of the breakdown of the Contract Amount by the Engineer, it shall be used as the basis for all Requests for Payment.

2.6.02 REQUESTS FOR PAYMENT:

Progress Payments. OWNER may make progress payments on the project based on the CONTRACTOR'S Applications for Payment as recommended by the Engineer during construction as provided below.

1. Prior to Substantial Completion progress payments will be in an amount equal to 90% of the Work completed, and 90% of materials and equipment not incorporated in the Work but delivered and suitably stored, less in each case the aggregate of payments previously made.
2. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 95% of the Contract Price, less such amounts as Engineer shall determine in accordance with paragraph 2.6.05 of the General Conditions.

2.6.03 DELETED

2.6.04 OWNER'S ACTION ON REQUEST FOR PAYMENT:

Within 30 days after receipt of a Request for Payment from the CONTRACTOR, the OWNER shall:

1. Process the Request for Payment as recommended by the Engineer.

2. Pay such other amount, in accordance with Paragraph 2.6.05, as he shall decide is due the CONTRACTOR, informing the CONTRACTOR and the Engineer in writing of his reasons for paying the amended amount.
3. Withhold payment in accordance with Paragraph 2.6.05, informing the CONTRACTOR and the Engineer of his reasons for withholding payment.

2.6.05 OWNER'S RIGHT TO WITHHOLD PAYMENT OF A REQUEST FOR PAYMENT:

The OWNER may withhold payment, in whole or in part, of a Request for Payment to the extent necessary to protect himself from loss on account of any of the following:

1. Defective work.
2. Evidence indicating the probable filing of claims by other parties against the CONTRACTOR which may adversely affect the OWNER.
3. Failure of the CONTRACTOR to make payments due to sub-contractor's, material suppliers, or employees.
4. Damage to another CONTRACTOR.

2.6.06 PAYMENT FOR UNCORRECTED WORK:

Should the OWNER direct the CONTRACTOR not to correct work that has been damaged or that was not performed in accordance with the Contract Documents, an equitable deduction from the Contract Amount shall be made to compensate the OWNER for the Uncorrected work.

2.6.07 PAYMENT FOR REMOVAL OF REJECTED WORK AND MATERIALS:

The removal of work and materials rejected in accordance with Paragraph 2.3.05 and the re-execution of acceptable work by the CONTRACTOR shall be at the expense of the CONTRACTOR, and he shall pay the cost of replacing the work of other CONTRACTOR'S destroyed or damaged by the removal of the rejected work or materials and the subsequent replacement of acceptable work.

1. Removal by OWNER: Removal of rejected work or materials and storage of materials by the OWNER, in accordance with Paragraph 2.3.05, shall be paid by the CONTRACTOR within 30 days after written notice to pay is given by the OWNER. If the CONTRACTOR does not pay the expenses of such removal and after ten days written notice being given by the OWNER of his intent to sell the materials, the OWNER may sell the materials at auction or at private sale and will pay the CONTRACTOR the net proceeds therefrom after deducting all the costs and expenses that should have been borne by the CONTRACTOR.

2.6.08 PAYMENT FOR EXTRA WORK:

Written notice of claims for payment for Extra Work shall be given by the CONTRACTOR within ten days after receipt of instructions from the OWNER to proceed with the Extra Work and before any work is commenced, except in an emergency endangering life or property. No claim shall be valid unless so made. In all cases, the CONTRACTOR'S itemized estimate sheets showing all labor and material shall be submitted to the OWNER. The OWNER'S order for Extra Work shall specify any extension of the Contract Time and one of the following methods of payment.

1. Unit prices or combinations of unit prices which formed the basis of the original Contract.
2. A lump sum based on the CONTRACTOR'S estimate and accepted by the OWNER.
3. Actual cost plus 15% for overhead and profit. Actual costs are defined as follows:
 - A. Labor costs, including all allowances for holidays, vacation, sick leave, apprentice programs, hospitalization, or other "fringe benefits" and including time of foreman while engaged directly upon extra work.
 - B. Labor insurance and taxes.
 - C. Materials and supplies used on the work.
 - D. Associated General CONTRACTOR'S of America standard rental rates on each piece of equipment having a value in excess of \$50.00. Equipment and tools of lesser value are considered "small tools" and, as such, are considered to be part of overhead.

2.6.09 PAYMENT FOR WORK SUSPENDED BY THE OWNER:

If the work or any part thereof shall be suspended by the OWNER and abandoned by the CONTRACTOR as provided in Paragraph 2.2.01 d., Suspension of Work by OWNER, the CONTRACTOR will then be entitled to payment for all work done on the portions so abandoned, plus 15% of the value of the abandoned work to compensate for overhead, plant expense, and anticipated profit.

2.6.10 PAYMENT FOR WORK BY THE OWNER:

The cost of the work performed by the OWNER, in removing construction equipment, tools, and supplies in accordance with Paragraph 2.5.08, Removal of Construction Equipment, Tools, and Supplies, and in correcting deficiencies in accordance with Paragraph 2.2.01 e., OWNER'S Right to Terminate the Agreement and Complete the Work shall be paid by the CONTRACTOR.

2.6.11 PAYMENT FOR WORK BY THE OWNER FOLLOWING HIS TERMINATION OF THE CONTRACT:

Upon termination of the Contract by the OWNER in accordance with Paragraph 2.2.01 e., OWNER'S Right to Terminate Agreement and Complete the Work, no further payments shall be due the CONTRACTOR until the work is completed. If the unpaid balance of the Contract Amount shall exceed the cost of completing the work including all overhead costs, the excess shall be paid to the CONTRACTOR. If the cost of completing the work shall exceed the unpaid balance, the CONTRACTOR shall pay the difference to the OWNER. The cost incurred by the OWNER, as herein provided, and the damage incurred through the CONTRACTOR'S default, shall be certified by the OWNER.

1. Unpaid Balance: If the unpaid balance of the Contract Sum exceeds the cost of finishing the work, including compensation for the Engineer's additional services, such shall be paid to the CONTRACTOR. If such costs exceed such unpaid balance, the CONTRACTOR shall pay the difference to the OWNER. The cost incurred by the OWNER as herein provided shall be certified by the Engineer.

2.6.12 PAYMENT FOR WORK TERMINATED BY THE CONTRACTOR:

Upon suspension of the work or termination of the Contract by the CONTRACTOR in accordance with Paragraph 2.2.02f, CONTRACTOR'S Right to Suspend Work or Terminate Agreement, the CONTRACTOR shall recover payment from the OWNER for the work performed, plus loss on plant and materials, plus established profit and damages.

2.6.13 PAYMENT FOR SAMPLES AND TESTING OF MATERIALS:

Samples furnished in accordance with Paragraph 2.3.02, Samples, shall be furnished by the CONTRACTOR at his expense and may be used in the work, after acceptance.

1. Testing of samples and materials furnished in accordance with Paragraph 2.3.02, Samples, shall be arranged and paid for by the OWNER.

2.6.14 ACCEPTANCE AND FINAL PAYMENT:

When the CONTRACTOR shall have completed the work in accordance with the terms of the Contract Documents, he shall certify completion of the work to the OWNER and submit a final Request for Payment, which shall be the Contract Amount plus all approved additions, less all approved deductions and less previous payments made. The CONTRACTOR shall furnish evidence that he has fully paid all debts for labor, materials, and equipment incurred in connection with the work, and, upon acceptance by the OWNER, the OWNER will release the CONTRACTOR, except as to the conditions of the Performance and Payment Bond, any legal rights of the OWNER, required guaranties, and Correction of Faulty Work after Final Payment, and will pay the CONTRACTOR'S final Request for Payment. The CONTRACTOR shall allow sufficient time between the time of completion of the work and approval of the final Request for Payment for the Engineer to assemble and check the necessary data.

1. Release of Liens: The CONTRACTOR shall deliver to the OWNER a complete release of all liens arising out of this Contract before the final Request for Payment is paid. If any lien remains unsatisfied after all payments are made, the CONTRACTOR shall refund to the OWNER such amounts as the OWNER may have been compelled to pay in discharging such liens including all costs and a reasonable attorney's fee.
2. Final Payment: The CONTRACTOR shall be paid in full within 61 days after the date of substantial completion. If within 61 days after substantial completion there remains uncompleted minor items, an amount equal to 200% of the value of each item as determined by the Engineer shall be withheld and paid 61 days following completion of all such items. This payment shall constitute final settlement.

SECTION 2.7 - CONTROL OF THE WORK

2.7.01 GENERAL:

The following general provisions have been taken verbatim from the Florida Department of Transportation Standard Specifications for Road and Bridge Construction with certain modifications to meet specific requirements of the City of Sanibel. The CONTRACTOR is advised to read these provisions very carefully and ensure that he fully understands all of the requirements.

2.7.02 PLANS AND WORKING DRAWINGS:

1. Plans and Contract Documents:

The CONTRACTOR will be furnished an appropriate number of copies of the plans and special provisions as required for the particular project. Copies of the Standard Specifications may be purchased from the Florida Department of Transportation. The CONTRACTOR shall have available on the work, at all times, one copy each of the plans, specifications and special provisions.

2. Plans:

The plans furnished by the Engineer consist of general drawings showing such details as are necessary to give a comprehensive idea of the construction contemplated. Roadway plans will show in general, alignment, profile grades, typical cross sections and general cross sections. Structure plans, in general, will show in detail all dimensions of the work contemplated. When the structure plans do not show the dimensions in detail, they will show general features and such details as are necessary to give a comprehensive idea of the structure.

3. Alterations in Plans:

All authorized alterations affecting the requirements and information given on the approved plans shall be in writing. No changes shall be made on any plan or drawing after its approval by the Engineer, except by direction of the Engineer.

4. Working Drawings (for Structures):

A. General:

The CONTRACTOR shall furnish, on sheets not larger than 24 inches by 36 inches, such working and detail drawings as may be required for any part of the structure and which are not included in plans furnished by the Engineer.

B. For Steel Structures:

Working Drawings for steel structures shall consist of shop detail, erection details and other working plans, showing details, dimensions, sizes of material, and other information necessary for the complete fabrication and erection of the metal work.

C. For Concrete Structures:

Working drawings for concrete structures shall consist of such detailed plans as may reasonably be required for the effective prosecution of the work and which are not included in plans furnished by the Engineer. These may include details of falsework, bracing centering and formwork, masonry layout diagrams, and diagrams for bending reinforcing steel.

D. Submission of Working Drawings:

The CONTRACTOR shall submit to the Engineer for approval three (3) sets of any required detailed shop or working drawings. These drawings shall be submitted in

sufficient time to allow adequate study and discussion and any necessary correction prior to beginning the work they cover. Prior to the approval of these drawings any work done, or materials ordered for the structures involved shall be at the CONTRACTOR'S risk. One set of these drawings will be returned to the CONTRACTOR, either approved or marked with corrections required. The other sets will be retained by the Engineer.

E. Responsibility of Accuracy of Working Drawings:

It is understood, however, that approval by the Engineer of the CONTRACTOR'S working drawings does not relieve the CONTRACTOR of any responsibility for accuracy of dimensions and details, or for conformity of dimensions and details. The CONTRACTOR shall be responsible for agreement and conformity of his working drawings with the approved plans and specifications.

F. Cost of Working Drawings:

The contract prices shall include the cost of furnishing all working drawings, and the CONTRACTOR will be allowed no extra compensation for such drawings.

2.7.03 COORDINATION OF PLANS, SPECIFICATIONS AND SPECIAL PROVISIONS:

These Specifications, the plans, special provisions, and all supplementary documents are integral parts of the contract, and a requirement occurring in one is as binding as though occurring in all.

They are intended to be complementary and to describe and provide for a complete work. In addition to the work and materials specifically called for in the Specifications as being included in any specific pay item, additional incidental work, not specifically mentioned, will be included in such pay item when so shown in the plans, or if indicated, or obvious and apparent, as being necessary for the proper completion of the work under such pay item and not stipulated as being covered under other pay items. In case of discrepancy, computed dimensions shall govern over scaled dimensions, plans shall govern over Standard Specifications, and special provisions shall govern over both Standard Specifications and Plans.

2.7.04 CONFORMITY OF WORK WITH PLANS:

All Work performed, and all materials furnished shall be in reasonably close conformity with the lines, grades, cross sections, dimensions, and material requirements, including tolerances, shown on the plans or indicated in the specifications.

In the event the Engineer finds the materials or the finished product in which the materials are used not within reasonable close conformity with the plans and specifications, but that reasonably acceptable work has been produced, he shall then make a determination if the work shall be accepted and remain in place. In this event, the Engineer will document the basis of acceptance by contract modification which will provide for an appropriate adjustment in the contract price for such work or materials as he deems necessary to conform to his determination based on engineering judgment.

In the event the Engineer finds the materials, or the finished product in which the materials are used, or the work performed are not in reasonably close conformity with the plans and specifications and have resulted in an inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected by and at the expense of the CONTRACTOR.

In the event the OWNER accepts the work that is not within these tolerances, appropriate deductions will be made from the actual amount used to cover the cost of the extra material. The amount will be computed based on the job mix formula and the unit price stated in the Contract.

2.7.05 ERRORS OR OMISSIONS IN PLANS OR SPECIFICATIONS:

The CONTRACTOR shall take no advantage of any apparent error or omission which he might discover in the plans or specifications but shall forthwith notify the Engineer of such discovery, who will then make such corrections and interpretations as he deems necessary for reflecting the actual spirit and intent of the plans and specifications.

2.7.06 AUTHORITY OF THE ENGINEER:

All work shall be available for inspection by the Engineer and performed to his satisfaction.

It is agreed by the parties hereto that the Engineer shall decide all questions, difficulties and disputes, of whatever nature, which may arise relative to the interpretation of the plans, construction, prosecution and fulfillment of the contract, and as to the character, quality, amount and value of any work done, and materials furnished, under or by reason of the contract.

2.7.07 AUTHORITY AND DUTIES OF ENGINEER'S ASSISTANTS:

The Engineer may appoint such assistants and representatives as he desires. They shall be authorized to inspect all work done and all materials furnished. Such inspection may extend to all or any part of the work and to the manufacture, preparation or fabrication of the materials to be used. Such assistants shall not be authorized to revoke, alter or waive any requirement of the specifications. They shall be authorized to call to the attention of the CONTRACTOR any failure of the work or materials to conform to the specifications and contract and shall have the authority to reject materials or suspend the work until any questions at issue can be referred to and decided by the Engineer. The CONTRACTOR shall be immediately notified in writing of any such suspension of the work and such notice shall state in detail the reasons for the suspension. The presence of the inspector or other assistant shall in no way lessen the responsibility of the CONTRACTOR.

2.7.08 CONSTRUCTION STAKES AND MARKERS:

1. Stakes Furnished:

The CONTRACTOR shall furnish and set, free of charge, slope stakes, grade stakes and all other stakes necessary for construction of the project. The CONTRACTOR shall furnish all templates and other materials necessary for making and maintaining points and lines given and shall furnish the Engineer such incidental labor as he may require in reestablishing points and lines necessary to the prosecution of the work.

2. Special Requirements for Landscape Work:

For landscape work, the OWNER will furnish all stakes in the size and quantity required and the CONTRACTOR shall set all such stakes with his own forces. The CONTRACTOR shall maintain such stakes in place until the layout is approved and the digging of the holes for the plantings has begun; replacing any which may become destroyed or disturbed during such period.

2.7.09 CONTRACTOR'S SUPERVISION:

1. Prosecution of work:

The CONTRACTOR shall give the work the constant attention necessary to assure the scheduled progress and he shall cooperate fully with the Engineer and with other CONTRACTOR'S at work in the vicinity.

2. CONTRACTOR'S Superintendent:

The CONTRACTOR shall at all times have on the work as his agent, a competent superintendent capable of thoroughly interpreting the plans and specifications and thoroughly experienced in the type of work being performed, who shall receive the instructions from the Engineer or his authorized representatives. The superintendent shall have full authority to execute the orders or directions of the Engineer and to supply promptly any materials, tools, equipment, labor and incidentals which may be required. Such superintendence shall be furnished regardless of the amount of work sublet.

3. Supervision for Emergencies:

The CONTRACTOR shall have a responsible person available at or reasonably near the work site on a 24-hour basis, seven days a week, in order that he may be contacted in emergencies and in cases where immediate action must be taken to maintain traffic or to handle any other problem that might arise. For compliance with this requirement outside of working hours, the furnishing of the telephone number where such person can be reached will suffice.

2.7.10 GENERAL INSPECTION REQUIREMENTS:

1. Cooperation by CONTRACTOR:

No work shall be done, nor materials used, without suitable inspection by the Engineer or his representative, and the CONTRACTOR shall furnish the Engineer with every reasonable facility for ascertaining whether the work performed, and materials used are in accordance with the requirements and intent of the plans and specifications. If the Engineer so requests, the CONTRACTOR shall, at any time before final acceptance of the work, remove or uncover such portions of the finished work as may be directed. After examination, the CONTRACTOR shall restore the uncovered portions of the work to the standard required by the specifications. Should the work so exposed or examined prove unacceptable, the uncovering or removal, and the replacing of the covering or making good of the parts removed, shall be at the CONTRACTOR'S expense. However, should the work thus exposed or examined prove acceptable, the uncovering or removing, and the replacing of the covering or making good of the parts removed, shall be paid for as extra work.

2. Failure of Engineer to Reject Work During Construction:

If, during or prior to construction operations, the Engineer should fail to reject defective work or materials, whether from lack of discovery of such defect or for any other reason, such initial failure to reject shall in no way prevent his later rejection when such defect is discovered, or obligate the Engineer to final acceptance, and the CONTRACTOR shall make no claim for losses suffered due to any necessary removals or repairs of such defects.

3. Failure to Remove and Renew Defective Materials and Work:

Should the CONTRACTOR fail or refuse to remove and renew any defective materials used or work performed, or to make any necessary repairs in an acceptable manner and in accordance with the requirements of the specifications, within the time indicated in writing, the Engineer shall have the authority to cause the unacceptable or defective materials or work to be repaired, removed and renewed, as may be necessary; all at the CONTRACTOR'S expense. Any expense incurred by the City in making these repairs, removals or renewals, which the CONTRACTOR has failed or refused to make, shall be paid for out of any moneys due or which may become due the CONTRACTOR, or may be charged against the contract bond. Continued failure or refusal on the part of the CONTRACTOR to make any or all necessary repairs promptly, fully and in an acceptable manner shall be sufficient cause for the City, at its option, to perform the work with its own organization, or to contract with any other individual, firm or corporation to perform the work. All costs and expenses incurred thereby shall be charged against the defaulting CONTRACTOR and the amount thereof deducted from any moneys due or which may become due to him or shall be charged against the contract bond. Any work performed, subsequent to forfeiture of the Contract, as described in this Article, shall not relieve the CONTRACTOR in any way of his responsibility for the work performed by him.

2.7.11 FINAL CONSTRUCTION INSPECTION:

1. Maintenance Until Final Acceptance:

The CONTRACTOR shall maintain all work in first-class condition until it has been completed as a whole and has been accepted by the Engineer under the provisions of 2.7.12.

2. Semifinal Inspections:

The Engineer will make a semifinal inspection within seven (7) days after notice from the CONTRACTOR of presumptive completion of the entire project. If, at the semifinal inspection, all construction provided for and contemplated by the contract is found completed to the Engineer's satisfaction, such inspection shall constitute the final inspection, as prescribed below. If, however, at any semifinal inspection any work is found unsatisfactory, in whole or in part, the Engineer shall give the CONTRACTOR the necessary instructions as to replacement of material and performance or re-performance of work necessary and prerequisite to final completion and acceptance, and the CONTRACTOR forthwith shall comply with and execute such instructions. Upon satisfactory replacement of material and performance or reperformance of such work, another inspection shall be made, which shall constitute the final inspection if the required material is found to have been replaced and the work completed satisfactorily.

3. Final Inspection:

Whenever all materials have been furnished, all work has been performed, and the construction contemplated by the contract has been satisfactorily completed, the Engineer will make the final inspection.

2.7.12 FINAL ACCEPTANCE:

When, upon completion of the final construction inspection, the work is found to be completed satisfactorily, the Engineer shall give the OWNER a written recommendation for acceptance of the work. The OWNER shall then satisfy himself as to the Engineer's recommendation and within five days of said recommendation notify the CONTRACTOR, in writing, of his acceptance of the work.

2.7.13 CLAIMS BY CONTRACTOR:

Where the CONTRACTOR deems that extra compensation is due him for work or materials not clearly covered in the contract or not ordered by the Engineer as extra work, as defined herein, the CONTRACTOR shall notify the Engineer in writing of his intentions to make claim for extra compensation, before he begins the work on which he bases the claim. If such notification is not given, and the Engineer is not afforded proper opportunity for keeping strict account of actual cost, as defined for force account, then the CONTRACTOR thereby agrees to waive the claim for such extra compensation. Such notice by the CONTRACTOR, and the fact that the Engineer has kept account of the cost as aforesaid, shall not in any way be construed as establishing the validity of the claim. In such case the claim after consideration by the Engineer, is found to be valid, it shall be allowed and paid for as extra as provided herein.

**STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
STANDARD TERMS AND CONDITIONS
APPLICABLE TO GRANT AGREEMENTS**

ATTACHMENT 1

1. Entire Agreement.

This Grant Agreement, including any Attachments and Exhibits referred to herein and/or attached hereto (Agreement), constitutes the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior agreements, whether written or oral, with respect to such subject matter. Any terms and conditions included on Grantee's forms or invoices shall be null and void.

2. Grant Administration.

- a. Order of Precedence. If there are conflicting provisions among the documents that make up the Agreement, the order of precedence for interpretation of the Agreement is as follows:
 - i. Standard Grant Agreement
 - ii. Attachments other than Attachment 1, in numerical order as designated in the Standard Grant Agreement
 - iii. Attachment 1, Standard Terms and Conditions
 - iv. The Exhibits in the order designated in the Standard Grant Agreement
- b. All approvals, written or verbal, and other written communication among the parties, including all notices, shall be obtained by or sent to the parties' Grant Managers. All written communication shall be by electronic mail, U.S. Mail, a courier delivery service, or delivered in person. Notices shall be considered delivered when reflected by an electronic mail read receipt, a courier service delivery receipt, other mail service delivery receipt, or when receipt is acknowledged by recipient. If the notice is delivered in multiple ways, the notice will be considered delivered at the earliest delivery time.
- c. If a different Grant Manager is designated by either party after execution of this Agreement, notice of the name and contact information of the new Grant Manager will be submitted in writing to the other party and maintained in the respective parties' records. A change of Grant Manager does not require a formal amendment or change order to the Agreement.
- d. This Agreement may be amended, through a formal amendment or a change order, only by a written agreement between both parties. A formal amendment to this Agreement is required for changes which cause any of the following:
 - (1) an increase or decrease in the Agreement funding amount;
 - (2) a change in Grantee's match requirements;
 - (3) a change in the expiration date of the Agreement;
 - (4) changes to the cumulative amount of funding transfers between approved budget categories, as defined in Attachment 3, Grant Work Plan, that exceeds or is expected to exceed twenty percent (20%) of the total budget as last approved by Department; and/or
 - (5) any changes to the terms and conditions of the Agreement other than the specific instances enumerated below when a change order may be used.A change order to this Agreement may be used when:
 - (1) task timelines within the current authorized Agreement period change;
 - (2) the cumulative transfer of funds between approved budget categories, as defined in Attachment 3, Grant Work Plan, are less than twenty percent (20%) of the total budget as last approved by Department;
 - (3) changing the current funding source as stated in the Standard Grant Agreement; and/or
 - (4) fund transfers between budget categories for the purposes of meeting match requirements.This Agreement may be amended to provide for additional services if additional funding is made available by the Legislature.
- e. All days in this Agreement are calendar days unless otherwise specified.

3. Agreement Duration.

The term of the Agreement shall begin and end on the dates indicated in the Standard Grant Agreement, unless extended or terminated earlier in accordance with the applicable terms and conditions. The Grantee shall be eligible for reimbursement for work performed on or after the date of execution through the expiration date of this Agreement, unless otherwise specified in Attachment 2, Special Terms and Conditions. However, work performed prior to the

execution of this Agreement may be reimbursable or used for match purposes if permitted by the Special Terms and Conditions.

4. Deliverables.

The Grantee agrees to render the services or other units of deliverables as set forth in Attachment 3, Grant Work Plan. The services or other units of deliverables shall be delivered in accordance with the schedule and at the pricing outlined in the Grant Work Plan. Deliverables may be comprised of activities that must be completed prior to Department making payment on that deliverable. The Grantee agrees to perform in accordance with the terms and conditions set forth in this Agreement and all attachments and exhibits incorporated by the Standard Grant Agreement.

5. Performance Measures.

The Grantee warrants that: (1) the services will be performed by qualified personnel; (2) the services will be of the kind and quality described in the Grant Work Plan; (3) the services will be performed in a professional and workmanlike manner in accordance with industry standards and practices; (4) the services shall not and do not knowingly infringe upon the intellectual property rights, or any other proprietary rights, of any third party; and (5) its employees, subcontractors, and/or subrecipients shall comply with any security and safety requirements and processes, if provided by Department, for work done at the Project Location(s). The Department reserves the right to investigate or inspect at any time to determine whether the services or qualifications offered by Grantee meet the Agreement requirements. Notwithstanding any provisions herein to the contrary, written acceptance of a particular deliverable does not foreclose Department's remedies in the event deficiencies in the deliverable cannot be readily measured at the time of delivery.

6. Acceptance of Deliverables.

- a. Acceptance Process. All deliverables must be received and accepted in writing by Department's Grant Manager before payment. The Grantee shall work diligently to correct all deficiencies in the deliverable that remain outstanding, within a reasonable time at Grantee's expense. If Department's Grant Manager does not accept the deliverables within 30 days of receipt, they will be deemed rejected.
- b. Rejection of Deliverables. The Department reserves the right to reject deliverables, as outlined in the Grant Work Plan, as incomplete, inadequate, or unacceptable due, in whole or in part, to Grantee's lack of satisfactory performance under the terms of this Agreement. The Grantee's efforts to correct the rejected deliverables will be at Grantee's sole expense. Failure to fulfill the applicable technical requirements or complete all tasks or activities in accordance with the Grant Work Plan will result in rejection of the deliverable and the associated invoice. Payment for the rejected deliverable will not be issued unless the rejected deliverable is made acceptable to Department in accordance with the Agreement requirements. The Department, at its option, may allow additional time within which Grantee may remedy the objections noted by Department. The Grantee's failure to make adequate or acceptable deliverables after a reasonable opportunity to do so shall constitute an event of default.

7. Financial Consequences for Nonperformance.

- a. Withholding Payment. In addition to the specific consequences explained in the Grant Work Plan and/or Special Terms and Conditions, the State of Florida (State) reserves the right to withhold payment when the Grantee has failed to perform/comply with provisions of this Agreement. None of the financial consequences for nonperformance in this Agreement as more fully described in the Grant Work Plan shall be considered penalties.
- b. Invoice reduction
If Grantee does not meet a deadline for any deliverable, the Department will reduce the invoice by 1% for each day the deadline is missed, unless an extension is approved in writing by the Department.
- c. Corrective Action Plan. If Grantee fails to correct all the deficiencies in a rejected deliverable within the specified timeframe, Department may, in its sole discretion, request that a proposed Corrective Action Plan (CAP) be submitted by Grantee to Department. The Department requests that Grantee specify the outstanding deficiencies in the CAP. All CAPs must be able to be implemented and performed in no more than sixty (60) calendar days.
 - i. The Grantee shall submit a CAP within ten (10) days of the date of the written request from Department. The CAP shall be sent to the Department's Grant Manager for review and approval. Within ten (10) days of receipt of a CAP, Department shall notify Grantee in writing whether the CAP proposed has been accepted. If the CAP is not accepted, Grantee shall have ten (10) days from receipt of Department letter rejecting the proposal to submit a revised proposed CAP. Failure to obtain Department approval of a CAP as specified above may result in Department's termination of this Agreement for cause as authorized in this Agreement.

- ii. Upon Department's notice of acceptance of a proposed CAP, Grantee shall have ten (10) days to commence implementation of the accepted plan. Acceptance of the proposed CAP by Department does not relieve Grantee of any of its obligations under the Agreement. In the event the CAP fails to correct or eliminate performance deficiencies by Grantee, Department shall retain the right to require additional or further remedial steps, or to terminate this Agreement for failure to perform. No actions approved by Department or steps taken by Grantee shall preclude Department from subsequently asserting any deficiencies in performance. The Grantee shall continue to implement the CAP until all deficiencies are corrected. Reports on the progress of the CAP will be made to Department as requested by Department's Grant Manager.
- iii. Failure to respond to a Department request for a CAP or failure to correct a deficiency in the performance of the Agreement as specified by Department may result in termination of the Agreement.

8. Payment.

- a. Payment Process. Subject to the terms and conditions established by the Agreement, the pricing per deliverable established by the Grant Work Plan, and the billing procedures established by Department, Department agrees to pay Grantee for services rendered in accordance with section 215.422, Florida Statutes (F.S.).
- b. Taxes. The Department is exempted from payment of State sales, use taxes and Federal excise taxes. The Grantee, however, shall not be exempted from paying any taxes that it is subject to, including State sales and use taxes, or for payment by Grantee to suppliers for taxes on materials used to fulfill its contractual obligations with Department. The Grantee shall not use Department's exemption number in securing such materials. The Grantee shall be responsible and liable for the payment of all its FICA/Social Security and other taxes resulting from this Agreement.
- c. Maximum Amount of Agreement. The maximum amount of compensation under this Agreement, without an amendment, is described in the Standard Grant Agreement. Any additional funds necessary for the completion of this Project are the responsibility of Grantee.
- d. Reimbursement for Costs. The Grantee shall be paid on a cost reimbursement basis for all eligible Project costs upon the completion, submittal, and approval of each deliverable identified in the Grant Work Plan. Reimbursement shall be requested on Exhibit C, Payment Request Summary Form. To be eligible for reimbursement, costs must be in compliance with laws, rules, and regulations applicable to expenditures of State funds, including, but not limited to, the Reference Guide for State Expenditures, which can be accessed at the following web address: <https://www.myfloridacfo.com/docs-sf/accounting-and-auditing-libraries/state-agencies/reference-guide-for-state-expenditures.pdf>.
- e. Rural Communities and Rural Areas of Opportunity. If Grantee is a county or municipality that qualifies as a "rural community" or "rural area of opportunity" (RAO) as defined in subsection 288.0656(2), F.S., such Grantee may request from the Department that all invoice payments under this Agreement be directed to the relevant county or municipality or to the RAO itself. The Department will agree to Grantee's request if:
 - i. Grantee demonstrates that it is a county or municipality that qualifies as a "rural community" or "rural area of opportunity" under subsection 288.0656(2), F.S.;
 - ii. Grantee demonstrates current financial hardship using one (1) or more of the "economic distress" factors defined in subsection 288.0656(2)(c), F.S.;
 - iii. Grantee's performance has been verified by the Department, which has determined that Grantee is eligible for invoice payments and that Grantee's performance has been completed in accordance with this Agreement's terms and conditions; and
 - iv. Applicable federal and state law(s), rule(s) and regulation(s) allow for such payments.

This subsection may not be construed to alter or limit any other applicable provisions of federal or state law, rule, or regulation. A current list of Florida's designated RAOs can be accessed at the following web address: <https://floridajobs.org/community-planning-and-development/rural-community-programs/rural-areas-of-opportunity>.
- f. Invoice Detail. All charges for services rendered or for reimbursement of expenses authorized by Department pursuant to the Grant Work Plan shall be submitted to Department in sufficient detail for a proper pre-audit and post-audit to be performed. The Grantee shall only invoice Department for deliverables that are completed in accordance with the Grant Work Plan.
- g. State Funds Documentation. Pursuant to section 216.1366, F.S., if Grantee meets the definition of a non-profit organization under section 215.97(2)(m), F.S., Grantee must provide the Department with documentation that indicates the amount of state funds:

- i. Allocated to be used during the full term of the contract or agreement for remuneration to any member of the board of directors or an officer.
- ii. Allocated under each payment by the public agency to be used for remuneration of any member of the board of directors or an officer.

The documentation must indicate the amounts and recipients of the remuneration. Such information must be posted on the State's the contract tracking system and maintained pursuant to section 215.985, F.S., and must be posted on the Grantee's website, if Grantee maintains a website.

- h. Interim Payments. Interim payments may be made by Department, at its discretion, if the completion of deliverables to date have first been accepted in writing by Department's Grant Manager.
- i. Final Payment Request. A final payment request should be submitted to Department no later than sixty (60) days following the expiration date of the Agreement to ensure the availability of funds for payment. However, all work performed pursuant to the Grant Work Plan must be performed on or before the expiration date of the Agreement.
- j. Annual Appropriation Contingency. The State's performance and obligation to pay under this Agreement is contingent upon an annual appropriation by the Legislature. This Agreement is not a commitment of future appropriations. Authorization for continuation and completion of work and any associated payments may be rescinded, with proper notice, at the discretion of Department if the Legislature reduces or eliminates appropriations.
- k. Interest Rates. All interest rates charged under the Agreement shall be calculated on the prevailing rate used by the State Board of Administration. To obtain the applicable interest rate, please refer to: <https://www.myfloridacfo.com/division/aa/local-governments/judgement-interest-rates>.
- l. Refund of Payments to the Department. Any balance of unobligated funds that have been advanced or paid must be refunded to Department. Any funds paid in excess of the amount to which Grantee or subgrantee is entitled under the terms of the Agreement must be refunded to Department. If this Agreement is funded with federal funds and the Department is required to refund the federal government, the Grantee shall refund the Department its share of those funds.

9. Documentation Required for Cost Reimbursement Grant Agreements and Match.

If Cost Reimbursement or Match is authorized in Attachment 2, Special Terms and Conditions, the following conditions apply. Supporting documentation must be provided to substantiate cost reimbursement or match requirements for the following budget categories:

- a. Salary/Wages. Grantee shall list personnel involved, position classification, direct salary rates, and hours spent on the Project in accordance with Attachment 3, Grant Work Plan in their documentation for reimbursement or match requirements.
- b. Overhead/Indirect/General and Administrative Costs. If Grantee is being reimbursed for or claiming match for multipliers, all multipliers used (i.e., fringe benefits, overhead, indirect, and/or general and administrative rates) shall be supported by audit. If Department determines that multipliers charged by Grantee exceeded the rates supported by audit, Grantee shall be required to reimburse such funds to Department within thirty (30) days of written notification. Interest shall be charged on the excessive rate.
- c. Contractual/Subaward Costs (Subcontractors/Subrecipients). Match or reimbursement requests for payments to subcontractors/subrecipients must be substantiated by copies of invoices with backup documentation identical to that required from Grantee. Subcontracts/subawards which involve payments for direct salaries shall clearly identify the personnel involved, salary rate per hour, and hours spent on the Project. All eligible multipliers used (i.e., fringe benefits, overhead, indirect, and/or general and administrative rates) shall be supported by audit. If Department determines that multipliers charged by any subcontractor/subrecipient exceeded the rates supported by audit, Grantee shall be required to reimburse such funds to Department within thirty (30) days of written notification. Interest shall be charged on the excessive rate. Nonconsumable and/or nonexpendable personal property or equipment costing \$5,000 or more purchased for the Project under a subcontract/subaward is subject to the requirements set forth in chapters 273 and/or 274, F.S., and Chapter 69I-72, Florida Administrative Code (F.A.C.) and/or Chapter 69I-73, F.A.C., as applicable. For grants funded with federal funds, nonconsumable and/or nonexpendable personal property or equipment costing \$10,000 or more purchased for the Project under a subcontract/subaward is subject to the requirements set forth in 2 CFR 200. The Grantee shall be responsible for maintaining appropriate property records for any subcontracts/subawards that include the purchase of equipment as part of the delivery of services. The Grantee shall comply with this requirement and ensure its subcontracts/subaward issued under this Agreement, if any, impose this requirement, in writing, on its subcontractors/subrecipients.

Attachment 1

- i. For fixed-price (vendor) subcontracts/subawards, the following provisions shall apply: The Grantee may award, on a competitive basis, fixed-price subcontracts/subawards to consultants/contractors in performing the work described in Attachment 3, Grant Work Plan. Invoices submitted to Department for fixed-price subcontracted/subawarded activities shall be supported with a copy of the subcontractor/subrecipient's invoice and a copy of the tabulation form for the competitive procurement process (e.g., Invitation to Bid, Request for Proposals, or other similar competitive procurement document) resulting in the fixed-price subcontract/subaward. The Grantee may request approval from Department to award a fixed-price subcontract/subaward resulting from procurement methods other than those identified above. In this instance, Grantee shall request the advance written approval from Department's Grant Manager of the fixed price negotiated by Grantee. The letter of request shall be supported by a detailed budget and Scope of Services to be performed by the subcontractor/subrecipient. Upon receipt of Department Grant Manager's approval of the fixed-price amount, Grantee may proceed in finalizing the fixed-price subcontract/subaward.
 - ii. If the procurement is subject to the Consultant's Competitive Negotiation Act under section 287.055, F.S., or the Brooks Act, Grantee must provide documentation clearly evidencing it has complied with the statutory or federal requirements.
- d. Travel. All requests for match or reimbursement of travel expenses shall be in accordance with section 112.061, F.S.
- e. Direct Purchase Equipment. For grants funded fully or in part with state funds, equipment is defined as capital outlay costing \$5,000 or more. For grants funded fully with federal funds, equipment is defined as capital outlay costing \$10,000 or more. Match or reimbursement for Grantee's direct purchase of equipment is subject to specific approval of Department and does not include any equipment purchased under the delivery of services to be completed by a subcontractor/subrecipient. Include copies of invoices or receipts to document purchases, and a properly completed Exhibit B, Property Reporting Form.
- f. Rental/Lease of Equipment. Match or reimbursement requests for rental/lease of equipment must include copies of invoices or receipts to document charges.
- g. Miscellaneous/Other Expenses. If miscellaneous or other expenses, such as materials, supplies, non-excluded phone expenses, reproduction, or mailing, are reimbursable or available for match or reimbursement under the terms of this Agreement, the documentation supporting these expenses must be itemized and include copies of receipts or invoices. Additionally, independent of Grantee's contract obligations to its subcontractor/subrecipient, Department shall not reimburse any of the following types of charges: cell phone usage; attorney's fees or court costs; civil or administrative penalties; or handling fees, such as set percent overages associated with purchasing supplies or equipment.
- h. Land Acquisition. Reimbursement for the costs associated with acquiring interest and/or rights to real property (including access rights through ingress/egress easements, leases, license agreements, or other site access agreements; and/or obtaining record title ownership of real property through purchase) must be supported by the following, as applicable: Copies of Property Appraisals, Environmental Site Assessments, Surveys and Legal Descriptions, Boundary Maps, Acreage Certification, Title Search Reports, Title Insurance, Closing Statements/Documents, Deeds, Leases, Easements, License Agreements, or other legal instrument documenting acquired property interest and/or rights. If land acquisition costs are used to meet match requirements, Grantee agrees that those funds shall not be used as match for any other Agreement supported by State or Federal funds.

10. Status Reports.

The Grantee shall submit status reports quarterly, unless otherwise specified in the Attachments, on Exhibit A, Progress Report Form, to Department's Grant Manager describing the work performed during the reporting period, problems encountered, problem resolutions, scheduled updates, and proposed work for the next reporting period. Quarterly status reports are due no later than twenty (20) days following the completion of the quarterly reporting period. For the purposes of this reporting requirement, the quarterly reporting periods end on March 31, June 30, September 30 and December 31. The Department will review the required reports submitted by Grantee within thirty (30) days.

11. Retainage.

The following provisions apply if Department withholds retainage under this Agreement:

- a. The Department reserves the right to establish the amount and application of retainage on the work performed under this Agreement up to the maximum percentage described in Attachment 2, Special Terms and Conditions. Retainage may be withheld from each payment to Grantee pending satisfactory completion of work and approval of all deliverables.

Attachment 1

- b. If Grantee fails to perform the requested work or fails to perform the work in a satisfactory manner, Grantee shall forfeit its right to payment of the retainage associated with the work. Failure to perform includes, but is not limited to, failure to submit the required deliverables or failure to provide adequate documentation that the work was actually performed. The Department shall provide written notification to Grantee of the failure to perform that shall result in retainage forfeiture. If the Grantee does not correct the failure to perform within the timeframe stated in Department's notice, the retainage will be forfeited to Department.
- c. No retainage shall be released or paid for incomplete work while this Agreement is suspended.
- d. Except as otherwise provided above, Grantee shall be paid the retainage associated with the work, provided Grantee has completed the work and submits an invoice for retainage held in accordance with the invoicing procedures under this Agreement.

12. Insurance.

- a. Insurance Requirements for Subrecipients and/or Subcontractors. The Grantee shall require its subrecipients and/or subcontractors, if any, to maintain insurance coverage of such types and with such terms and limits as described in this Agreement. The Grantee shall require all its subrecipients and/or subcontractors, if any, to make compliance with the insurance requirements of this Agreement a condition of all contracts that are related to this Agreement. Subrecipients and/or subcontractors must provide proof of insurance upon request.
- b. Deductibles. The Department shall be exempt from, and in no way liable for, any sums of money representing a deductible in any insurance policy. The payment of such deductible shall be the sole responsibility of the Grantee providing such insurance.
- c. Proof of Insurance. Upon execution of this Agreement, Grantee shall provide Department documentation demonstrating the existence and amount for each type of applicable insurance coverage *prior to* performance of any work under this Agreement. Upon receipt of written request from Department, Grantee shall furnish Department with proof of applicable insurance coverage by standard form certificates of insurance, a self-insured authorization, or other certification of self-insurance.
- d. Duty to Maintain Coverage. In the event that any applicable coverage is cancelled by the insurer for any reason, or if Grantee cannot get adequate coverage, Grantee shall immediately notify Department of such cancellation and shall obtain adequate replacement coverage conforming to the requirements herein and provide proof of such replacement coverage within ten (10) days after the cancellation of coverage.
- e. Insurance Trust. If the Grantee's insurance is provided through an insurance trust, the Grantee shall instead add the Department of Environmental Protection, its employees, and officers as an additional covered party everywhere the Agreement requires them to be added as an additional insured.

13. Termination.

- a. Termination for Convenience. When it is in the State's best interest, Department may, at its sole discretion, terminate the Agreement in whole or in part by giving 30 days' written notice to Grantee. The Department shall notify Grantee of the termination for convenience with instructions as to the effective date of termination or the specific stage of work at which the Agreement is to be terminated. The Grantee must submit all invoices for work to be paid under this Agreement within thirty (30) days of the effective date of termination. The Department shall not pay any invoices received after thirty (30) days of the effective date of termination.
- b. Termination for Cause. The Department may terminate this Agreement if any of the events of default described in the Events of Default provisions below occur or in the event that Grantee fails to fulfill any of its other obligations under this Agreement. If, after termination, it is determined that Grantee was not in default, or that the default was excusable, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of Department. The rights and remedies of Department in this clause are in addition to any other rights and remedies provided by law or under this Agreement.
- c. Grantee Obligations upon Notice of Termination. After receipt of a notice of termination or partial termination unless as otherwise directed by Department, Grantee shall not furnish any service or deliverable on the date, and to the extent specified, in the notice. However, Grantee shall continue work on any portion of the Agreement not terminated. If the Agreement is terminated before performance is completed, Grantee shall be paid only for that work satisfactorily performed for which costs can be substantiated. The Grantee shall not be entitled to recover any cancellation charges or lost profits.
- d. Continuation of Prepaid Services. If Department has paid for any services prior to the expiration, cancellation, or termination of the Agreement, Grantee shall continue to provide Department with those services for which it has already been paid or, at Department's discretion, Grantee shall provide a refund for services that have been paid for but not rendered.

- e. Transition of Services Upon Termination, Expiration, or Cancellation of the Agreement. If services provided under the Agreement are being transitioned to another provider(s), Grantee shall assist in the smooth transition of Agreement services to the subsequent provider(s). This requirement is at a minimum an affirmative obligation to cooperate with the new provider(s), however additional requirements may be outlined in the Grant Work Plan. The Grantee shall not perform any services after Agreement expiration or termination, except as necessary to complete the transition or continued portion of the Agreement, if any.

14. Notice of Default.

If Grantee defaults in the performance of any covenant or obligation contained in the Agreement, including, any of the events of default, Department shall provide notice to Grantee and an opportunity to cure that is reasonable under the circumstances. This notice shall state the nature of the failure to perform and provide a time certain for correcting the failure. The notice will also provide that, should the Grantee fail to perform within the time provided, Grantee will be found in default, and Department may terminate the Agreement effective as of the date of receipt of the default notice.

15. Events of Default.

Provided such failure is not the fault of Department or outside the reasonable control of Grantee, the following non-exclusive list of events, acts, or omissions, shall constitute events of default:

- a. The commitment of any material breach of this Agreement by Grantee, including failure to timely deliver a material deliverable, failure to perform the minimal level of services required for a deliverable, discontinuance of the performance of the work, failure to resume work that has been discontinued within a reasonable time after notice to do so, or abandonment of the Agreement;
- b. The commitment of any material misrepresentation or omission in any materials, or discovery by the Department of such, made by the Grantee in this Agreement or in its application for funding;
- c. Failure to submit any of the reports required by this Agreement or having submitted any report with incorrect, incomplete, or insufficient information;
- d. Failure to honor any term of the Agreement;
- e. Failure to abide by any statutory, regulatory, or licensing requirement, including an entry of an order revoking the certificate of authority granted to the Grantee by a state or other licensing authority;
- f. Failure to pay any and all entities, individuals, and furnishing labor or materials, or failure to make payment to any other entities as required by this Agreement;
- g. Employment of an unauthorized alien in the performance of the work, in violation of Section 274 (A) of the Immigration and Nationality Act;
- h. Failure to maintain the insurance required by this Agreement;
- i. One or more of the following circumstances, uncorrected for more than thirty (30) days unless, within the specified 30-day period, Grantee (including its receiver or trustee in bankruptcy) provides to Department adequate assurances, reasonably acceptable to Department, of its continuing ability and willingness to fulfill its obligations under the Agreement:
 - i. Entry of an order for relief under Title 11 of the United States Code;
 - ii. The making by Grantee of a general assignment for the benefit of creditors;
 - iii. The appointment of a general receiver or trustee in bankruptcy of Grantee's business or property; and/or
 - iv. An action by Grantee under any state insolvency or similar law for the purpose of its bankruptcy, reorganization, or liquidation.

16. Suspension of Work.

The Department may, in its sole discretion, suspend any or all activities under the Agreement, at any time, when it is in the best interest of the State to do so. The Department shall provide Grantee written notice outlining the particulars of suspension. Examples of reasons for suspension include, but are not limited to, budgetary constraints, declaration of emergency, or other such circumstances. After receiving a suspension notice, Grantee shall comply with the notice. Within 90 days, or any longer period agreed to by the parties, Department shall either: (1) issue a notice authorizing resumption of work, at which time activity shall resume; or (2) terminate the Agreement. If the Agreement is terminated after 30 days of suspension, the notice of suspension shall be deemed to satisfy the thirty (30) days' notice required for a notice of termination for convenience. Suspension of work shall not entitle Grantee to any additional compensation.

17. Force Majeure.

The Grantee shall not be responsible for delay resulting from its failure to perform if neither the fault nor the negligence of Grantee or its employees or agents contributed to the delay and the delay is due directly to acts of God, wars, acts

of public enemies, strikes, fires, floods, or other similar cause wholly beyond Grantee's control, or for any of the foregoing that affect subcontractors/subrecipients or suppliers if no alternate source of supply is available to Grantee. In case of any delay Grantee believes is excusable, Grantee shall notify Department in writing of the delay or potential delay and describe the cause of the delay either (1) within ten days after the cause that creates or will create the delay first arose, if Grantee could reasonably foresee that a delay could occur as a result; or (2) if delay is not reasonably foreseeable, within five days after the date Grantee first had reason to believe that a delay could result. **THE FOREGOING SHALL CONSTITUTE THE GRANTEE'S SOLE REMEDY OR EXCUSE WITH RESPECT TO DELAY.** Providing notice in strict accordance with this paragraph is a condition precedent to such remedy. No claim for damages, other than for an extension of time, shall be asserted against Department. The Grantee shall not be entitled to an increase in the Agreement price or payment of any kind from Department for direct, indirect, consequential, impact or other costs, expenses or damages, including but not limited to costs of acceleration or inefficiency, arising because of delay, disruption, interference, or hindrance from any cause whatsoever. If performance is suspended or delayed, in whole or in part, due to any of the causes described in this paragraph, after the causes have ceased to exist Grantee shall perform at no increased cost, unless Department determines, in its sole discretion, that the delay will significantly impair the value of the Agreement to Department, in which case Department may: (1) accept allocated performance or deliveries from Grantee, provided that Grantee grants preferential treatment to Department with respect to products subjected to allocation; (2) contract with other sources (without recourse to and by Grantee for the related costs and expenses) to replace all or part of the products or services that are the subject of the delay, which purchase may be deducted from the Agreement quantity; or (3) terminate Agreement in whole or in part.

18. Indemnification.

- a. The Grantee shall be fully liable for the actions of its agents, employees, partners, and subcontractors/subrecipients and shall fully indemnify, defend, and hold harmless Department and its officers, agents, and employees, from suits, actions, damages, and costs of every name and description arising from or relating to:
 - i. personal injury and damage to real or personal tangible property alleged to be caused in whole or in part by Grantee, its agents, employees, partners, and subcontractors/subrecipients; provided, however, that Grantee shall not indemnify for that portion of any loss or damages proximately caused by the negligent act or omission of Department;
 - ii. the Grantee's breach of this Agreement or the negligent acts or omissions of Grantee.
- b. The Grantee's obligations under the preceding paragraph with respect to any legal action are contingent upon Department giving Grantee: (1) written notice of any action or threatened action; (2) the opportunity to take over and settle or defend any such action at Grantee's sole expense; and (3) assistance in defending the action at Grantee's sole expense. The Grantee shall not be liable for any cost, expense, or compromise incurred or made by Department in any legal action without Grantee's prior written consent, which shall not be unreasonably withheld.
- c. Notwithstanding sections a. and b. above, the following is the sole indemnification provision that applies to Grantees that are governmental entities: Each party hereto agrees that it shall be solely responsible for the negligent or wrongful acts of its employees and agents. However, nothing contained herein shall constitute a waiver by either party of its sovereign immunity or the provisions of section 768.28, F.S. Further, nothing herein shall be construed as consent by a state agency or subdivision of the State to be sued by third parties in any matter arising out of any contract or this Agreement.
- d. No provision in this Agreement shall require Department to hold harmless or indemnify Grantee, insure or assume liability for Grantee's negligence, waive Department's sovereign immunity under the laws of Florida, or otherwise impose liability on Department for which it would not otherwise be responsible. Any provision, implication or suggestion to the contrary is null and void.

19. Limitation of Liability.

The Department's liability for any claim arising from this Agreement is limited to compensatory damages in an amount no greater than the sum of the unpaid balance of compensation due for goods or services rendered pursuant to and in compliance with the terms of the Agreement. Such liability is further limited to a cap of \$100,000.

20. Remedies.

Nothing in this Agreement shall be construed to make Grantee liable for force majeure events. Nothing in this Agreement, including financial consequences for nonperformance, shall limit Department's right to pursue its remedies for other types of damages under the Agreement, at law or in equity. The Department may, in addition to

other remedies available to it, at law or in equity and upon notice to Grantee, retain such monies from amounts due Grantee as may be necessary to satisfy any claim for damages, penalties, costs and the like asserted by or against it.

21. Waiver.

The delay or failure by Department to exercise or enforce any of its rights under this Agreement shall not constitute or be deemed a waiver of Department's right thereafter to enforce those rights, nor shall any single or partial exercise of any such right preclude any other or further exercise thereof or the exercise of any other right.

22. Statutory Notices Relating to Unauthorized Employment and Subcontracts/Subawards.

- a. The Department shall consider the employment by any Grantee of unauthorized aliens a violation of Section 274A(e) of the Immigration and Nationality Act. If Grantee/subcontractor/subrecipient knowingly employs unauthorized aliens, such violation shall be cause for unilateral cancellation of this Agreement. The Grantee shall be responsible for including this provision in all subcontracts/subawards with private organizations issued as a result of this Agreement.
- b. Pursuant to sections 287.133, 287.134, and 287.137 F.S., the following restrictions apply to persons placed on the convicted vendor list, discriminatory vendor list, or the antitrust violator vendor list:
 - i. Public Entity Crime. A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a Grantee, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in section 287.017, F.S., for CATEGORY TWO for a period of 36 months following the date of being placed on the convicted vendor list.
 - ii. Discriminatory Vendors. An entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity.
 - iii. Antitrust Violator Vendors. A person or an affiliate who has been placed on the antitrust violator vendor list following a conviction or being held civilly liable for an antitrust violation may not submit a bid, proposal, or reply on any contract to provide any good or services to a public entity; may not submit a bid, proposal, or reply on any contract with a public entity for the construction or repair of a public building or public work; may not submit a bid, proposal, or reply on leases of real property to a public entity; may not be awarded or perform work as a Grantee, supplier, subcontractor, or consultant under a contract with a public entity; and may not transact new business with a public entity.
 - iv. Notification. The Grantee shall notify Department if it or any of its suppliers, subcontractors, or consultants have been placed on the convicted vendor list, the discriminatory vendor list, or antitrust violator vendor list during the life of the Agreement. The Florida Department of Management Services is responsible for maintaining the discriminatory vendor list and the antitrust violator vendor list and posts the list on its website. Questions regarding the discriminatory vendor list or antitrust violator vendor list may be directed to the Florida Department of Management Services, Office of Supplier Development, at (850) 487-0915.

23. Compliance with Federal, State and Local Laws.

- a. The Grantee and all its agents shall comply with all federal, state and local regulations, including, but not limited to, nondiscrimination, wages, social security, workers' compensation, licenses, and registration requirements. The Grantee shall include this provision in all subcontracts/subawards issued as a result of this Agreement.
- b. The Grantee, its subrecipients, subcontractors and agents must also comply with the following civil rights laws and regulations:
 - i. Title VI of the Civil Rights Act of 1964 as amended (prohibiting discrimination in federally assisted programs on the basis of race, color, or national origin in the delivery of services or benefits);

- ii. Section 13 of the 1972 Amendment to the Federal Water Pollution Control Act (prohibiting discrimination on the basis of sex in the delivery of services or benefits under the Federal Water Pollution Control Act as amended);
 - iii. Section 504 of the Rehabilitation Act of 1973 (prohibiting discrimination in federally assisted programs on the basis of disability, both in employment and in the delivery of services and benefits);
 - iv. Age Discrimination Act of 1975 (prohibiting discrimination in federally assisted programs on the basis of age in the delivery of services or benefits);
 - v. 40 C.F.R. Part 7, (implementing Title VI of the Civil Rights Act of 1964, Section 13 of the 1972 Amendments to the Federal Water Pollution Control Act, and Section 504 of the Rehabilitation Act of 1973);
 - vi. Florida Civil Rights Act of 1992 (Title XLIV Chapter 760, Sections 760.01, 760.11 and 509.092, F.S.), including Part I, chapter 760, F.S. (prohibiting discrimination on the basis of race, color, religion, sex, pregnancy, national origin, age, handicap, or marital status).
- c. This Agreement shall be governed by and construed in accordance with the laws of the State of Florida.
 - d. Any dispute concerning performance of the Agreement shall be processed as described herein. Jurisdiction for any damages arising under the terms of the Agreement will be in the courts of the State, and venue will be in the Second Judicial Circuit, in and for Leon County. Except as otherwise provided by law, the parties agree to be responsible for their own attorney fees incurred in connection with disputes arising under the terms of this Agreement.

24. Build America, Buy America Act (BABA) - Infrastructure Projects with Federal Funding.

This provision does not apply to Agreements that are wholly funded by Coronavirus State and Local Fiscal Recovery Funds under the American Rescue Plan Act. Also, this provision does not apply where there is a valid waiver in place. However, the provision may apply to funds expended before the waiver or after expiration of the waiver.

If applicable, Recipients or Subrecipients of an award of Federal financial assistance from a program for infrastructure are required to comply with the Build America, Buy America Act (BABA), including the following provisions:

- a. All iron and steel used in the project are produced in the United States--this means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States;
- b. All manufactured products used in the project are produced in the United States--this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation; and
- c. All construction materials are manufactured in the United States--this means that all manufacturing processes for the construction material occurred in the United States.

The Buy America preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does a Buy America preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project but are not an integral part of the structure or permanently affixed to the infrastructure project.

25. Investing in America

Grantees of an award for construction projects in whole or in part by the Bipartisan Infrastructure Law or the Inflation Reduction Act, including the following provision:

- a. Signage Requirements
 - a. Investing in America Emblem: The recipient will ensure that a sign is placed at construction sites supported in whole or in part by this award displaying the official Investing in America emblem and must identify the project as a “project funded by President Biden’s Bipartisan Infrastructure Law” or “project funded by President Biden’s Inflation Reduction Act” as applicable. The sign must be placed at construction sites in an easily visible location that can be directly linked to the work taking place and must be maintained in good condition throughout the construction period.

The recipient will ensure compliance with the guidelines and design specifications provided by EPA for using the official Investing in America emblem available at:
<https://www.epa.gov/invest/investing-america-signage>.

b. Procuring Signs: Consistent with section 6002 of RCRA, 42 U.S.C. 6962, and 2 CFR 200.323, recipients are encouraged to use recycled or recovered materials when procuring signs. Signage costs are considered an allowable cost under this assistance agreement provided that the costs associated with signage are reasonable. Additionally, to increase public awareness of projects serving communities where English is not the predominant language, recipients are encouraged to translate the language on signs (excluding the official Investing in America emblem or EPA logo or seal) into the appropriate non-English language(s). The costs of such translation are allowable, provided the costs are reasonable.

26. Scrutinized Companies.

- a. Grantee certifies that it is not on the Scrutinized Companies that Boycott Israel List or engaged in a boycott of Israel. Pursuant to section 287.135, F.S., the Department may immediately terminate this Agreement at its sole option if the Grantee is found to have submitted a false certification; or if the Grantee is placed on the Scrutinized Companies that Boycott Israel List or is engaged in the boycott of Israel during the term of the Agreement.
- b. If this Agreement is for more than one million dollars, the Grantee certifies that it is also not on the Scrutinized Companies with Activities in Sudan, Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or engaged with business operations in Cuba or Syria as identified in section 287.135, F.S. Pursuant to section 287.135, F.S., the Department may immediately terminate this Agreement at its sole option if the Grantee is found to have submitted a false certification; or if the Grantee is placed on the Scrutinized Companies with Activities in Sudan List, or Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or engaged with business operations in Cuba or Syria during the term of the Agreement.
- c. As provided in subsection 287.135(8), F.S., if federal law ceases to authorize these contracting prohibitions, then they shall become inoperative.

27. Lobbying and Integrity.

The Grantee agrees that no funds received by it under this Agreement will be expended for the purpose of lobbying the Legislature or a State agency pursuant to section 216.347, F.S., except that pursuant to the requirements of section 287.058(6), F.S., during the term of any executed agreement between Grantee and the State, Grantee may lobby the executive or legislative branch concerning the scope of services, performance, term, or compensation regarding that agreement. The Grantee shall comply with sections 11.062 and 216.347, F.S.

28. Record Keeping.

The Grantee shall maintain books, records and documents directly pertinent to performance under this Agreement in accordance with United States generally accepted accounting principles (US GAAP) consistently applied. The Department, the State, or their authorized representatives shall have access to such records for audit purposes during the term of this Agreement and for five (5) years following the completion date or termination of the Agreement. In the event that any work is subcontracted or subawarded, Grantee shall similarly require each subcontractor/subrecipient to maintain and allow access to such records for audit purposes. Upon request of Department's Inspector General, or other authorized State official, Grantee shall provide any type of information the Inspector General deems relevant to Grantee's integrity or responsibility. Such information may include, but shall not be limited to, Grantee's business or financial records, documents, or files of any type or form that refer to or relate to Agreement. The Grantee shall retain such records for the longer of: (1) three years after the expiration of the Agreement; or (2) the period required by the General Records Schedules maintained by the Florida Department of State (available at: <http://dos.myflorida.com/library-archives/records-management/general-records-schedules/>).

29. Audits.

- a. Inspector General. The Grantee understands its duty, pursuant to section 20.055(5), F.S., to cooperate with the inspector general in any investigation, audit, inspection, review, or hearing. The Grantee will comply with this duty and ensure that its subrecipients and/or subcontractors issued under this Agreement, if any, impose this requirement, in writing, on its subrecipients and/or subcontractors, respectively.
- b. Physical Access and Inspection. Department personnel shall be given access to and may observe and inspect work being performed under this Agreement, with reasonable notice and during normal business hours, including by any of the following methods:

- i. Grantee shall provide access to any location or facility on which Grantee is performing work, or storing or staging equipment, materials or documents;
 - ii. Grantee shall permit inspection of any facility, equipment, practices, or operations required in performance of any work pursuant to this Agreement; and,
 - iii. Grantee shall allow and facilitate sampling and monitoring of any substances, soils, materials or parameters at any location reasonable or necessary to assure compliance with any work or legal requirements pursuant to this Agreement.
- c. **Special Audit Requirements.** The Grantee shall comply with the applicable provisions contained in Attachment 5, Special Audit Requirements. Each amendment that authorizes a funding increase or decrease shall include an updated copy of Exhibit 1, to Attachment 5. If Department fails to provide an updated copy of Exhibit 1 to include in each amendment that authorizes a funding increase or decrease, Grantee shall request one from the Department's Grants Manager. The Grantee shall consider the type of financial assistance (federal and/or state) identified in Attachment 5, Exhibit 1 and determine whether the terms of Federal and/or Florida Single Audit Act Requirements may further apply to lower tier transactions that may be a result of this Agreement. For federal financial assistance, Grantee shall utilize the guidance provided under 2 CFR §200.331 for determining whether the relationship represents that of a subrecipient or vendor. For State financial assistance, Grantee shall utilize the form entitled "Checklist for Nonstate Organizations Recipient/Subrecipient vs Vendor Determination" (form number DFS-A2-NS) that can be found under the "Links/Forms" section appearing at the following website: <https://apps.fldfs.com/fsaa>.
- d. **Proof of Transactions.** In addition to documentation provided to support cost reimbursement as described herein, Department may periodically request additional proof of a transaction to evaluate the appropriateness of costs to the Agreement pursuant to State guidelines (including cost allocation guidelines) and federal, if applicable. Allowable costs and uniform administrative requirements for federal programs can be found under 2 CFR 200. The Department may also request a cost allocation plan in support of its multipliers (overhead, indirect, general administrative costs, and fringe benefits). The Grantee must provide the additional proof within thirty (30) days of such request.
- e. **No Commingling of Funds.** The accounting systems for all Grantees must ensure that these funds are not commingled with funds from other agencies. Funds from each agency must be accounted for separately. Grantees are prohibited from commingling funds on either a program-by-program or a project-by-project basis. Funds specifically budgeted and/or received for one project may not be used to support another project. Where a Grantee's, or subrecipient's, accounting system cannot comply with this requirement, Grantee, or subrecipient, shall establish a system to provide adequate fund accountability for each project it has been awarded.
 - i. If Department finds that these funds have been commingled, Department shall have the right to demand a refund, either in whole or in part, of the funds provided to Grantee under this Agreement for non-compliance with the material terms of this Agreement. The Grantee, upon such written notification from Department shall refund, and shall forthwith pay to Department, the amount of money demanded by Department. Interest on any refund shall be calculated based on the prevailing rate used by the State Board of Administration. Interest shall be calculated from the date(s) the original payment(s) are received from Department by Grantee to the date repayment is made by Grantee to Department.
 - ii. In the event that the Grantee recovers costs, incurred under this Agreement and reimbursed by Department, from another source(s), Grantee shall reimburse Department for all recovered funds originally provided under this Agreement and interest shall be charged for those recovered costs as calculated on from the date(s) the payment(s) are recovered by Grantee to the date repayment is made to Department.
 - iii. Notwithstanding the requirements of this section, the above restrictions on commingling funds do not apply to agreements where payments are made purely on a cost reimbursement basis.

30. Conflict of Interest.

The Grantee covenants that it presently has no interest and shall not acquire any interest which would conflict in any manner or degree with the performance of services required.

31. Independent Contractor.

The Grantee is an independent contractor and is not an employee or agent of Department.

32. Subcontracting/Subawards.

- a. Unless otherwise specified in the Special Terms and Conditions, all services contracted for are to be performed solely by Grantee.

- b. The Department may, for cause, require the replacement of any Grantee employee, subcontractor/subrecipient, or agent. For cause, includes, but is not limited to, technical or training qualifications, quality of work, change in security status, or non-compliance with an applicable Department policy or other requirement.
- c. The Department may, for cause, deny access to Department's secure information or any facility by any Grantee employee, subcontractor/subrecipient, or agent.
- d. The Department's actions under paragraphs b. or c. shall not relieve Grantee of its obligation to perform all work in compliance with the Agreement. The Grantee shall be responsible for the payment of all monies due under any subcontract/subaward. The Department shall not be liable to any subcontractor/subrecipient for any expenses or liabilities incurred under any subcontract/subaward, and Grantee shall be solely liable to the subcontractor for all expenses and liabilities incurred under any subcontract/subaward.
- e. The Department will not deny Grantee's employees, subcontractors/subrecipients, or agents access to meetings within the Department's facilities, unless the basis of Department's denial is safety or security considerations.
- f. A list of minority-owned firms that could be offered subcontracting opportunities may be obtained by contacting the Office of Supplier Development at (850) 487-0915.
- g. The Grantee shall not be liable for any excess costs for a failure to perform, if the failure to perform is caused by the default of a subcontractor/subrecipient at any tier, and if the cause of the default is completely beyond the control of both Grantee and the subcontractor(s)/subrecipient(s), and without the fault or negligence of either, unless the subcontracted/subawarded products or services were obtainable from other sources in sufficient time for Grantee to meet the required delivery schedule.

33. Guarantee of Parent Company.

If Grantee is a subsidiary of another corporation or other business entity, Grantee asserts that its parent company will guarantee all of the obligations of Grantee for purposes of fulfilling the obligations of Agreement. In the event Grantee is sold during the period the Agreement is in effect, Grantee agrees that it will be a requirement of sale that the new parent company guarantee all of the obligations of Grantee.

34. Survival.

The respective obligations of the parties, which by their nature would continue beyond the termination or expiration of this Agreement, including without limitation, the obligations regarding confidentiality, proprietary interests, and public records, shall survive termination, cancellation, or expiration of this Agreement.

35. Third Parties.

The Department shall not be deemed to assume any liability for the acts, failures to act or negligence of Grantee, its agents, servants, and employees, nor shall Grantee disclaim its own negligence to Department or any third party. This Agreement does not and is not intended to confer any rights or remedies upon any person other than the parties. If Department consents to a subcontract/subaward, Grantee will specifically disclose that this Agreement does not create any third-party rights. Further, no third parties shall rely upon any of the rights and obligations created under this Agreement.

36. Severability.

If a court of competent jurisdiction deems any term or condition herein void or unenforceable, the other provisions are severable to that void provision, and shall remain in full force and effect.

37. Grantee's Employees, Subcontractors/Subrecipients and Agents.

All Grantee employees, subcontractors/subrecipients, or agents performing work under the Agreement shall be properly trained technicians who meet or exceed any specified training qualifications. Upon request, Grantee shall furnish a copy of technical certification or other proof of qualification. All employees, subcontractors/subrecipients, or agents performing work under Agreement must comply with all security and administrative requirements of Department and shall comply with all controlling laws and regulations relevant to the services they are providing under the Agreement.

38. Assignment.

The Grantee shall not sell, assign, or transfer any of its rights, duties, or obligations under the Agreement, or under any purchase order issued pursuant to the Agreement, without the prior written consent of Department. In the event of any assignment, Grantee remains secondarily liable for performance of the Agreement, unless Department expressly waives such secondary liability. The Department may assign the Agreement with prior written notice to Grantee of its intent to do so.

39. Compensation Report.

If this Agreement is a sole-source, public-private agreement or if the Grantee, through this agreement with the State, annually receive 50% or more of their budget from the State or from a combination of State and Federal funds, the Grantee shall provide an annual report, including the most recent IRS Form 990, detailing the total compensation for

the entities' executive leadership teams. Total compensation shall include salary, bonuses, cashed-in leave, cash equivalents, severance pay, retirement benefits, deferred compensation, real-property gifts, and any other payout. The Grantee must also inform the Department of any changes in total executive compensation between the annual reports. All compensation reports must indicate what percent of compensation comes directly from the State or Federal allocations to the Grantee.

40. Disclosure of Gifts from Foreign Sources.

If the value of the grant under this Agreement is \$100,000 or more, Grantee shall disclose to Department any current or prior interest of, any contract with, or any grant or gift received from a foreign country of concern, as defined in section 286.101, F.S., if such interest, contract, or grant or gift has a value of \$50,000 or more and such interest existed at any time or such contract or grant or gift was received or in force at any time during the previous 5 years. Such disclosure shall include the name and mailing address of the disclosing entity, the amount of the contract or grant or gift or the value of the interest disclosed, the applicable foreign country of concern and, if applicable, the date of termination of the contract or interest, the date of receipt of the grant or gift, and the name of the agent or controlled entity that is the source or interest holder. If the disclosure requirement is applicable as described above, then within 1 year before applying for any grant, Grantee must also provide a copy of such disclosure to the Department of Financial Services.

41. Food Commodities.

To the extent authorized by federal law, the Department, its grantees, contractors and subcontractors/subrecipients shall give preference to food commodities grown or produced in this state when purchasing food commodities, including farm products as defined in section 823.14, F.S., of any class, variety, or use thereof in their natural state or as processed by a farm operation or processor for the purpose of marketing such product.

42. Anti-human Trafficking.

If the Grantee is a nongovernmental entity, the Grantee must provide the Department with an affidavit signed by an officer or a representative of the Grantee under penalty of perjury attesting that the Grantee does not use coercion for labor or services as defined in section 787.06, F.S.

43. Iron and Steel for Public Works Projects.

If this Agreement funds a "public works project" as defined in section 255.0993, F.S., or the purchase of materials to be used in a public works project, any iron or steel permanently incorporated in the Project must be "produced in the United States," as defined in section 255.0993, F.S. This requirement does not apply if the Department determines that any of the following circumstances apply to the Project:

- (1) iron or steel products produced in the United States are not produced in sufficient quantities, reasonably available, or of satisfactory quality;
- (2) the use of iron or steel products produced in the United States will increase the total cost of the project by more than twenty percent (20%); or
- (3) complying with this requirement is inconsistent with the public interest.

Further, this requirement does not prevent the Contractor's minimal use of foreign steel and iron materials if:

- (1) such materials are incidental or ancillary to the primary product and are not separately identified in the project specifications; and
- (2) the "cost" of such materials, as defined in section 255.0993, F.S., does not exceed one-tenth of one percent (1%) of the total Project Cost under this Agreement or \$2,500, whichever is greater.

Electrical components, equipment, systems, and appurtenances, including supports, covers, shielding, and other appurtenances related to an electrical system that are necessary for operation or concealment (excepting transmission and distribution poles) are not considered to be iron or steel products and are, therefore, exempt from the requirements of this paragraph.

This provision shall be applied in a manner consistent with and may not be construed to impair the state's obligations under any international agreement.

44. Complete and Accurate information.

Grantee represents and warrants that all statements and information provided to DEP are current, complete, and accurate. This includes all statements and information in this Grant, as well as its Attachments and Exhibits.

45. Execution in Counterparts and Authority to Sign.

This Agreement, any amendments, and/or change orders related to the Agreement, may be executed in counterparts, each of which shall be an original and all of which shall constitute the same instrument. In accordance with the Electronic Signature Act of 1996, electronic signatures, including facsimile transmissions, may be used and shall have the same force and effect as a written signature. Each person signing this Agreement warrants that he or she is duly authorized to do so and to bind the respective party to the Agreement.

Attachment 1

SPECIAL PROVISIONS

FLORIDA DEP STANDARD TERMS AND CONDITIONS APPLICABLE
TO GRANT AGREEMENTS

Sections Applicable to this Contract:

Paragraph 22. Statutory Notices Relating to Unauthorized Employment and Subcontracts/Subawards

Paragraph 23. Compliance with Federal, State and Local Laws

REQUIRED CONTRACT PROVISIONS

TERMINATION FOR CAUSE OR CONVENIENCE; REMEDIES

This contract is for more than the simplified acquisition threshold, currently set at \$250,000, so it must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms and provide for such sanctions and penalties as appropriate. See 2 C.F.R. Part 200, Appendix II(A). This requirement applies to all FEMA grant and cooperative agreement programs.

The City of Sanibel may terminate the contract at any time for breach of contractual obligations or for convenience, by providing the provider with a written notice of such cancellation. In the event of a termination for cause, the termination shall become effective on the date specified in the notice of cancellation, and the City of Sanibel shall have no continuing financial or other obligations to the Contractor from the effective date of the termination through what otherwise would have remained of the contract term. In the event of a termination for convenience, such termination shall not be earlier than 30 days from the date of such written notice, and the City shall be obligated to pay reasonable, substantiated demobilization costs but shall otherwise have no continuing financial or other obligations to the Contractor from the effective date of the termination through what otherwise would have remained for the contract term.

ACCESS TO RECORDS

The following access to records requirements apply to this contract: (1) The contractor agrees to provide the State of Florida (or any of its agencies), the City of Sanibel, the FEMA Administrator, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions. (2) The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed. (3) The contractor agrees to provide the FEMA Administrator or his authorized representatives access to construction or other work sites pertaining to the work being completed under the contract."

COMPLIANCE WITH FEDERAL LAW, REGULATIONS AND EXECUTIVE ORDERS

This is an acknowledgement that FEMA financial assistance will be used to fund the contract only. The contractor will comply with all applicable federal law, regulations, executive orders, FEMA policies, procedures, and directives.

NO OBLIGATION BY FEDERAL GOVERNMENT

The Federal Government is not a party to this contract and is not subject to any obligations or liabilities to the non-Federal entity, contractor, or any other party pertaining to any matter resulting from the contract.

PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS OR RELATED ACTS

The contractor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to the contractor's actions pertaining to this contract.

COPELAND ANTI-KICKBACK ACT

Compliance with the Copeland "Anti-Kickback" Act.

The contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clause above and such other clauses as FEMA may by appropriate instructions require, and 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 these contract clauses.

Breach. A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12.

CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Compliance with the Contract Work Hours and Safety Standards Act.

The following clauses set forth in 29 C.F.R. § 5.5(b) are required, in accordance with the Contract Work Hours and Safety Standards Act:

- (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 \$27 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 City of Sanibel 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 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.

CLEAN AIR ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT

Federal Water Pollution Control Act

The contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.

The contractor agrees to report each violation to the City of Sanibel and understands and agrees that the City of Sanibel will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

The contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance provided by FEMA.

EQUAL EMPLOYMENT OPPORTUNITY

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

- (1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants' employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
- (2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration

for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

- (3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.
- (4) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- (5) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- (6) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- (7) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- (8) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: provided, however, that in the event a contractor

becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

The City of Sanibel further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: *provided, however*, that if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The City of Sanibel agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The City of Sanibel further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

DEBARMENT AND SUSPENSION

This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such, the contractor is required to verify that none of the contractor's principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

The contractor must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

This certification is a material representation of fact relied upon by The City of Sanibel. If it is later determined that the contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R.

pt. 3000, subpart C, in addition to remedies available to the City of Sanibel, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

The bidder or proposer agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

BYRD ANTI-LOBBYING AMENDMENT

Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352 (as amended)

Contractors who apply or bid for an award of \$100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the awarding agency.

Required Certification. If applicable, contractors must sign and submit to the non-federal entity the following certification.

APPENDIX A, 44 C.F.R. PART 18 – CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned

shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The Contractor _____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

Signature of Contractor's Authorized Official

Name and Title of Contractor's Authorized Official

Date

PROCUREMENT OF RECOVERED MATERIAL

This required contract provision applies to all procurements over \$10,000 made by a state agency or an agency of a political subdivision of a state and its contractors.

The requirements include: Procuring only items designated in EPA guidelines that contain the highest practical percentage of recovered materials consistent with maintaining competition, where the purchase price of the item is greater than \$10,000, or the value of the amount of items purchased in the preceding fiscal year was greater than \$10,000; Procuring solid waste management services in a way that maximizes energy and resource recovery; and Establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired Competitively within a timeframe providing for compliance with the contract performance schedule; Meeting contract performance requirements; or At a reasonable price. Information about this requirement, along with the list of EPA-designated items, is available at EPA's Comprehensive Procurement Guidelines webpage: <https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program>. The Contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act."

PROHIBITION ON CONTRACTING FOR COVERED TELECOMMUNICATIONS EQUIPMENT OR SERVICES

Section 889(b)(1) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (FY2019 NDAA) and 2 C.F.R. § 200.216, as implemented by FEMA Policy 405-143-1, Prohibitions on Expending FEMA Award Funds for Covered Telecommunications Equipment or Services (Interim), prohibit the obligation or expending of federal award funds on certain telecommunication products or from certain entities for national security reasons. Effective August 13, 2020, FEMA recipients and subrecipients, as well as their contractors and subcontractors, may not obligate or expend any FEMA award funds to:

- a. Procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;
- b. Enter into, extend, or renew a contract to procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system; or
- c. Enter into, extend, or renew contracts with entities that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

"Prohibition on Contracting for Covered Telecommunications Equipment or Services (a) Definitions. As used in this clause, the terms backhaul; covered foreign country; covered telecommunications equipment or services; interconnection arrangements; roaming; substantial or essential component; and telecommunications equipment or services have the meaning as defined in FEMA Policy 405-143-1, Prohibitions on Expending FEMA Award Funds for Covered Telecommunications Equipment or Services (Interim), as used in this clause— (b) Prohibitions. (1) Section 889(b) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232, and 2 C.F.R. § 200.216 prohibit the head of an executive agency on or after Aug.13, 2020, from obligating or expending grant, cooperative agreement, loan, or loan guarantee funds on certain telecommunications products or from certain entities for national security reasons. (2) Unless an exception in paragraph (c) of this clause applies, the contractor and its

subcontractors may not use grant, cooperative agreement, loan, or loan guarantee funds from the Federal Emergency Management Agency to: (i) Procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system; (ii) Enter into, extend, or renew a contract to procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system; (iii) Enter into, extend, or renew contracts with entities that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system; or (iv) Provide, as part of its performance of this contract, subcontract, or other contractual instrument, any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. (c) Exceptions. (1) This clause does not prohibit contractors from providing— (i) A service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or Contract Provisions Guide 28 (ii) Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles. (2) By necessary implication and regulation, the prohibitions also do not apply to: (i) Covered telecommunications equipment or services that: i. Are not used as a substantial or essential component of any system; and ii. Are not used as critical technology of any system. (ii) Other telecommunications equipment or services that are not considered covered telecommunications equipment or services. (d) Reporting requirement. (1) In the event the contractor identifies covered telecommunications equipment or services used as a substantial or essential component of any system, or as critical technology as part of any system, during contract performance, or the contractor is notified of such by a subcontractor at any tier or by any other source, the contractor shall report the information in paragraph (d)(2) of this clause to the recipient or subrecipient, unless elsewhere in this contract are established procedures for reporting the information. (2) The Contractor shall report the following information pursuant to paragraph (d)(1) of this clause: (i) Within one business day from the date of such identification or notification: The contract number; the order number(s), if applicable; supplier name; supplier unique entity identifier (if known); supplier Commercial and Government Entity (CAGE) code (if known); brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended. (ii) Within 10 business days of submitting the information in paragraph (d)(2)(i) of this clause: Any further available information about mitigation actions undertaken or recommended. In addition, the contractor shall describe the efforts it undertook to prevent use or submission of covered telecommunications equipment or services, and any additional efforts that will be incorporated to prevent future use or submission of covered telecommunications equipment or services. (e) Subcontracts. The Contractor shall insert the substance of this clause, including this paragraph (e), in all subcontracts and other contractual instruments.”

DOMESTIC PREFERENCES FOR PROCUREMENT

As appropriate, and to the extent consistent with law, NFEs should, to the greatest extent practicable under a federal award, provide a preference for the purchase, acquisition, or use of goods, products or materials produced in the United States. This includes, but is not limited to, iron, aluminum, steel, cement, and other manufactured products.

As appropriate, and to the extent consistent with law, the contractor should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States. This includes, but is not limited to iron, aluminum, steel, cement, and other manufactured products. For purposes of this clause: Produced in the United States means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. Manufactured products mean items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.”

CONTRACT CHANGES OR MODIFICATIONS

To be allowable under a FEMA grant or cooperative agreement award, the cost of any contract change, modification, amendment, addendum, change order, or constructive change must be necessary, allocable, within the scope of the grant or cooperative agreement, reasonable for the scope of work, and otherwise allowable.

AFFIRMATIVE SOCIOECONOMIC STEPS

For procurements under FEMA declarations and awards issued on or after November 12, 2020, all NFEs are required to take the six affirmative steps to ensure use of small and minority businesses, women’s business enterprises, and labor surplus area firms when possible. One of the six steps is to require the prime contractor, if subcontracts are to be let, to take the five other affirmative steps, For procurements under FEMA declarations and awards issued between December 26, 2014, and November 12, 2020, this requirement only applies to non-state entities.

If subcontracts are to be let, the prime contractor is required to take all necessary steps identified in 2 C.F.R. § 200.321(b)(1)-(5) to ensure that small and minority businesses, women’s business enterprises, and labor surplus area firms are used when possible.

COPYRIGHT AND DATA RIGHTS

An NFE is required by 2 C.F.R. § 200.315 to provide certain licenses with respect to copyright and data to the federal awarding agency. 2 C.F.R. § 200.315(b) provides to the federal awarding agency “a royalty-free, nonexclusive and irrevocable right to reproduce, publish, or otherwise use [any work that is subject to copyright] for federal purposes, and to authorize others to do so.” 2 C.F.R. § 200.315(d) provides to the federal government the rights to “obtain, reproduce, publish, or otherwise use” data produced under a federal award and to authorize others to do the same.

The Contractor grants to the City of Sanibel a paid-up, royalty-free, nonexclusive, irrevocable, worldwide license in data first produced in the performance of this contract to reproduce, publish, or otherwise use, including prepare derivative works, distribute copies to the public, and perform publicly and display publicly such data. For data required by the contract but not first produced in the performance of this contract, the Contractor will identify such data and grant to the City of Sanibel or acquires on its behalf a license of the same scope as for data first produced in the performance of this contract. Data, as used herein, shall include any work subject to copyright under 17 U.S.C. § 102, for example, any written reports or literary works, software and/or source code, music, choreography, pictures or images, graphics, sculptures, videos, motion pictures or other audiovisual works, sound and/or video recordings, and architectural works. Upon or before the completion of this contract, the Contractor will deliver to the City of Sanibel data first produced in the performance of this contract and data required by the contract but not first produced in the performance of this contract in formats acceptable by the City of Sanibel.”

CONTRACT DOCUMENTS

CITY OF SANIBEL DONAX WATER RECLAMATION FACILITY (WRF) POST HURRICANE IAN REPAIRS & HARDENING

TECHNICAL SPECIFICATIONS

NOVEMBER 2025

Prepared For:



Prepared By:



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BIDSET

**CITY OF SANIBEL WATER RECLAMATION FACILITY (WRF)
POST HURRICANE IAN REPAIRS & HARDENING**

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POST HURRICANE IAN REPAIRS & HARDENING**

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DIVISION 1

GENERAL **REQUIREMENTS**

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 LOCATION

- A. The work described by these specifications is located at the Donax Reclamation Facility (WRF), owned by the City of Sanibel.

1.02 DESCRIPTION

- A. The Work to be done consists of furnishing all labor, equipment, materials and services required, regardless of climate conditions that are considered normal to the area for the season. The improvements generally include:
 - 1. Supplemental Carbon System to Mitigate Post-Ian Reduced Influent CBOD
 - 2. Wastewater Collection System SCADA Control Room Improvements
 - 3. Sodium Hypochlorite Feed Line Hardening
 - 4. Replace Effluent Flow Meter
 - 5. Chlorine Contact Tank No. 1 Repairs and Coating
 - 6. Internal Recycle Pumping Systems to Mitigate Post-Ian Reduced Influent CBOD
 - 7. Replacement of Inlet Valves for Fine Screens
- B. Contractor's Duties:
 - 1. Cooperate with the Owner or Owner's Representatives.
 - 2. Except as specifically noted, provide and pay for:
 - a. Labor, materials, and equipment.
 - b. Tools, construction equipment, and machinery.
 - c. Water and utilities required for construction.
 - d. Other facilities and services necessary for the proper execution and completion of the Work.
 - 3. Secure and pay for, as necessary for the proper execution and completion of the Work, and as applicable at time of receipt of bids:

- a. The Owner will pay Building permit fees internally.
 - b. The Contractor shall pay all other government fees.
 - c. The Contractor shall pay for all required licenses.
 - 4. Give the required notices.
 - 5. Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities that bear on performance of Work.
 - 6. Promptly submit written notice to Engineer of observed variance of Contract Documents from legal requirements.
 - 7. Enforce strict discipline and good order among employees. Do not employ Work persons not skilled in their assigned task.
 - 8. The Contractor shall furnish personnel and equipment that will be efficient, appropriate, and large enough to secure a satisfactory quality of work and a rate of progress that will ensure the completion of the work within the time stipulated in the Proposal. If, at any time, such personnel appear to the Engineer to be inefficient, inappropriate or insufficient for securing the quality of work aforesaid, he may order the Contractor to increase the efficiency, change the character or increase personnel and 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 obligations to secure the quality of the work and rate of progress.
 - 9. The Contractor shall be responsible for restoring all disturbed private property, resulting from his construction activities, or the activities of his sub-consultants, at no additional cost to the Owner.
 - 10. The Contractor shall confine his activities to the site(s) designated by the Owner for the Work or for materials storage.
 - 11. Contractor, Contractor's personnel, subcontractors, and all other agents of the Contractor shall be appropriately clothed for the work performed (shirt must be worn) and must be courteous to Owner, Engineer, other agents of the Owner, and the public. Contractor shall promptly remove personnel from the project upon the request of Owner.
- C. The Contractor shall commence with all work as indicated in the Contract Documents with the initial Notice to Proceed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01025

MEASUREMENT AND PAYMENT

Part 1 - GENERAL

- A. The Contractor shall receive and accept the compensation provided in the Proposal and the Contract as full payment for furnishing all materials, labor, tools and equipment, for performing all operations necessary to complete the work under the Contract, and also in full payment for all loss or damages arising from the nature of the work, or from any discrepancy between the actual quantities of work and quantities herein estimated by the Engineer, or from the action of the elements or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the Owner.
- B. The prices stated in the proposal include all costs and expenses for taxes, labor, equipment, materials, commissions, transportation charges and expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the work as shown on the Drawings and specified herein. The basis of payment for an item at the unit price shown in the proposal shall be in accordance with the description of that item in this Section.
- C. The Contractor's attention is again called to the fact that the quotations for the various items of work are intended to establish a total price for completing the work in its entirety. Should the Contractor feel that the cost for any item of work has not been established by the Bid Form or Payment Items, he shall include the cost for that work in some other applicable bid item, so that his proposal for the project does reflect his total price for completing the work in its entirety.
- D. Contractor shall provide all other items necessary for a complete and functioning facility within the standards of the industry shall be furnished regardless of whether or not they are specifically shown or specified.

1.01 MEASUREMENT

- A. Actual quantities for unit price bid items ascertained by using a tape measure or electronic distance measuring device in conjunction with conventional computation methods for determining areas of regular and irregular shapes.
- B. Measurements will not be made for lump sum bid items. The Contractor shall submit pricing breakdowns or a schedule of values for each lump sum item which shall be in sufficient detail to facilitate a monthly determination of the value of work performed. The pricing breakdown or schedule of values shall be submitted prior to the preconstruction meeting and it will be subject to approval by the Owner and Engineer.

1.02 PAYMENT

- A. Payments to the Contractor for unit price items shall be based on measured quantities of items completed in accordance with the Drawings and Specifications and the respective unit prices. Retainage shall apply to all unit price items.
- B. Payments to the Contractor for lump items shall be based on the estimated level of completion and the prices set forth in the schedule of values. Payment will only be issued for work completed in accordance with the Drawings and Specification. Retainage shall apply to all lump sum price items.
- C. The City will pay the City fees associated with the Building Permit. Labor, administrative costs, mark-up, and other expense shall be included Bid Item No. 1.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01027

APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Submit Applications for Payment to the Engineer in accordance with schedule established by Conditions of the Contract and Agreement between Owner and Contractor.
- B. Related Requirements Described Elsewhere:
 - 1. Agreement: Division 0.
 - 2. Measurement and Payment: Section 01025.
 - 3. Project Schedule Using CPM Network Analysis: Section 01310.
 - 4. Schedule of Values: Section 01370.
 - 5. Construction Photographs and Audio-Video Preconstruction Documentation: Section 01380.
 - 6. Contract Closeout: Section 01700.
 - 7. Project Record Documents: Section 01720.

1.02 FORMAT REQUIRED

- A. Submit applications typed on a form approved by the Engineer along with paper continuation sheets.
- B. The Contractor shall use the item descriptions and contract values included in schedule of values, approved and accepted by the Engineer as a basis for applications for payment.

1.03 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Form:

1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.
2. Fill in percent complete for each activity and dollar values to agree with respective percents.
3. Execute certification with signature of a responsible officer of Contractor.

B. Continuation Sheets:

1. Fill in total list of all scheduled component items of the Work, with item number and scheduled dollar value for each item.
2. Fill in dollar value in each column for each scheduled line item when Work has been performed or products stored. Round off values to nearest dollar, or as specified for Schedule of Values.
3. List each Change Order executed prior to date of submission, at the end of the continuation sheets. List by Change Order Number, and description, as for an original component item of the Work.
4. To receive approval for payment on component material stored on site, submit copies of the original invoices with the Application and Certificate for Payment.
5. As provided for in the Application and Certificate for Payment form, the Contractor shall certify, for each current pay request, that all previous progress payments received from the Owner, under this Contract, have been applied by the Contractor to discharge in full, all obligations of the Contractor in connection with Work covered by prior Applications for Payment, and all materials and equipment incorporated into the Work are free and clear of all liens, claims, security interest, and encumbrances. Contractor shall attach to each Application and Certificate for Payment like affidavits by all Subcontractors. If Subcontractor or supplier notifies Owner of unpaid claims, Owner can request validation of payment or lien waivers for all future payments.

1.04 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. Contractor shall submit suitable information, with a cover letter identifying:

1. Project.
2. Application number and date.
3. Detailed list of enclosures.

4. For stored products:
 - a. Item number and identification as shown on application.
 - b. Description of specific material.
 - c. Items must be on-site to receive payment for stored materials.
- B. Submit one (1) copy of data and cover letter for each copy of application.
- C. The Contractor is to maintain an updated set of drawings to be used as record drawings in accordance with Section 01720: Project Record Documents. As a prerequisite for monthly progress payments, the Contractor is to exhibit the updated record drawings for review by the Owner and the Engineer.
- D. Each monthly application for payment shall incorporate the corresponding "monthly progress status report" and updated construction schedule, prepared in accordance with the requirements of Section 01310: Construction Progress Schedules.
- E. As a prerequisite for payment, Contractor shall submit a duly executed letter from surety consenting to payment due and progress to date for each progress payment.
- F. Provide construction photographs in accordance with Section 01380: Construction Photographs.

1.05 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in application form as specified for progress payments. Provide information as required by the General Conditions and Section 01700: Contract Closeout.
- B. Furnish evidence of completed operations and insurance in accordance with the General Conditions.
- C. Provide Contractor's Final Release of Lien (Section 00849) and other close-out submittals as required by the General Conditions.
- D. As a prerequisite for payment, Contractor shall submit a duly executed letter from surety consenting to payment due and progress to date for final payment.

1.06 SUBMITTAL PROCEDURE

- A. Submit Applications for Payment to the Engineer between the first (1st) and the tenth (10th) day after the end of each calendar month for which payment is requested as stipulated in the Agreement. Review the percents complete with the Engineer and resolve any conflicts or discrepancies.

- B. When the Engineer finds the Application and Certificate for Payment Form is properly completed and correct, he will execute the Certificate for Payment and transmit the forms to the Owner, with a copy to the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01041

PROJECT COORDINATION

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Furnish personnel and equipment that will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress that will ensure the completion of the work within the Contract Time. If at any time such personnel appears to the Engineer to be inefficient, inappropriate or insufficient for securing the quality of work aforementioned, he may order the Contractor to increase the efficiency, change the character or increase the personnel and 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 obligations to secure the quality of the work and rate of progress.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION COORDINATION

- A. The Contractor is required to coordinate construction activities with the Owner and Engineer in order to maintain sufficient progress in the work.
- B. The Contractor shall notify the Owner and Engineer at least:
 - 1. 48 hours in advance of all work activities on the site.
 - 2. 72 hours in advance of taking any equipment off-line.
- C. The project schedule shall be coordinated with the Owner and WWTF staff to assure that plant operations are not disrupted.
- D. Contractor shall take all measures necessary to protect all plant facilities.
- E. The Contractor shall be responsible for coordinating all sub-contractors and trades and in incorporating the work of all subcontractors or trades where necessary and as required.

3.02 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. All newly constructed or coated work shall be carefully protected from damage in any way. All portions damaged shall be reconstructed or recoated by the Contractor at his expense.
- B. Protect all structures in a suitable manner to prevent damage. Should any part of a structure become heaved, cracked or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the Contractor at his own expense and to the satisfaction of the Engineer. If in the final inspection of the work, any defects, faults or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials and labor required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein and any damages caused by the performance of the Work, for at least the warranty period described in the Contract.
- C. The Contractor shall completely restore all pavement, landscaping, or other areas disturbed by construction activities.

3.03 PRIVATE LAND

- A. The Contractor shall not enter or occupy private land outside the site, except by written permission of the appropriate owners. Contractor shall provide Owner a copy of such written permission.

3.04 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 expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in other manner acceptable to the Engineer.

3.05 COOPERATION WITHIN THIS CONTRACT

- A. The Contractor shall, prior to interrupting a utility service (water, sewer, etc.) for the purpose of making cut-ins to the existing lines or for any other purposes, contact the Owner and make arrangements for the interruption which will be satisfactory to the Owner.
- B. The Contractor shall notify the Owner prior to using the Owner's water for flushing or testing.

3.06 SECURITY

- A. The WRF site is a secure, restricted access facility. All employees of Contractor, subcontractors, delivery personnel or other personnel must check-in at the operations building before entering the property each day.
- B. The Contractor shall provide 48-hour advance notice to the Wastewater Treatment Manager of any shipments that will be arriving.
- C. Construction personnel are prohibited from leaving their immediate work area and wandering around the WRF or into operations building or other buildings.

END OF SECTION

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SECTION 01065

PERMITS AND FEES

PART 1 - GENERAL

- 1.01 The Contractor shall secure and pay for all permits and licenses related to his work, including but not limited to, necessary construction permits as provided for in Division 0 except as otherwise provided herein.

A. Permits By CONTRACTOR

1. Dewatering permits, as required.
2. Building permit fees will be paid internally by the Owner.
3. Local Regulatory Agency Permit(s) (i.e., City, County, etc.).

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01070

ABBREVIATIONS

PART 1 - GENERAL

Wherever in these Specifications and Contract Documents the abbreviations, or pronouns in place of them are used, the intent and meaning shall be interpreted as specified herein.

1.01 ABBREVIATIONS

AA	-	Aluminum Association
AASHTO	-	American Association of State Highway and Transportation Officials
ACI	-	American Concrete Institute
ACPA	-	American Concrete Pipe Association
AEIC	-	Association of Edison Illuminating Companies
AFBMA	-	Anti-Friction Bearing Manufacturers Association
AGMA	-	American Gear Manufacturers Association
AIEE	-	American Institute of Electrical Engineers
AISC	-	American Institute of Steel Construction
AISI	-	American Iron and Steel Institute
ANSI	-	American National Standards Institute
APHA	-	American Public Health Association
API	-	American Petroleum Institute
ASCE	-	American Society of Civil Engineers
ASHRACE	-	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	-	American Society of Mechanical Engineers
ASTM	-	American Society for Testing and Materials
AWS	-	American Welding Society
AWWA	-	American Water Works Association
CFR	-	Code of Federal Regulations
CIPP	-	Cured-in-place Pipe
CRSI	-	Concrete Reinforcing Steel Institute
EIA	-	Electrical Industries Association
EPA	-	Environmental Protection Agency
FDEP	-	Florida Department of Environmental Protection
FDOT	-	Florida Department of Transportation
FMHA	-	Farmers Home Administration
FS	-	Federal Specifications
HDPE	-	High Density Polyethylene
IEEE	-	Institute of Electronic and Electrical Engineers
IES	-	Illuminating Engineering Society
IPCEA	-	Insulated Power Cable Engineers Association
ISA	-	Instrument Society of America
NBS	-	National Bureau of Standards
NRMA	-	National Ready-Mix Association

NEC	-	National Electric Code
NEMA	-	National Electrical Manufacturers Association
NSF	-	National Sanitation Foundation
OSHA	-	Occupational Safety and Health Administration
PCA	-	Portland Cement Association
PPI		Plastics Pipe Institute
SBC	-	Southern Building Code
SSPC	-	Steel Structures Painting Council
UBC	-	Uniform Building Code
UL	-	Underwriters Laboratories
USDC	-	United States Department of Commerce
USDHUD	-	United States Department of Housing and Urban Development

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01091

REFERENCE SPECIFICATIONS

PART 1 - GENERAL

1.01 GENERAL

- A. Applicable Publications. Whenever in these specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Work is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the drawings shall be waived because of any provision of or omission from said standards or requirements.
- B. Assignment of Specialists. In certain instances, specification test requires (or implies) that specific Work is to be assigned to specialist or expert entities who must be engaged for the performance of the Work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the Work. They are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of Work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the Contractor.

1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Without limiting the generality of other requirements of the specifications, all Work specified herein shall conform to or exceed the requirements of such documents are not in conflict with the requirements of these specifications not the applicable codes.
- B. References herein to "Building Code" shall mean the Florida Building Code. The latest edition of the code as approved and used by the local agency as of the date of award as adopted by the agency having jurisdiction shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.
- C. In case of conflict between codes, reference standards, drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor. The Contractor shall bid the most stringent requirements.

- D. Applicable Standard Specifications. The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01100

SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 PUBLIC NUISANCE

- A. The Contractor shall not create a public nuisance including, but not limited to, encroachment on adjacent lands, flooding of adjacent lands, excessive noise, or undue traffic disruption.
- B. No extra charge may be made for time lost due to work stoppage resulting from the creation or avoidance of a public nuisance.

1.02 JURISDICTIONAL DISPUTES

- A. It shall be the responsibility of the Contractor to pay all costs that may be required to perform any of the work shown on the Drawings or specified herein in order to avoid any work stoppages due to jurisdictional disputes. The basis for subletting work in question, if any, shall conform to precedent agreements and decisions on record with the Building and Construction Trades Department, AFL-CIO, dated June, 1973, including any amendments thereto.

1.03 SPECIFICATION SAFETY REQUIREMENTS

- A. The following safety requirements are comprehensive in nature with some site specificity; therefore, not all sections are applicable to every Contract. Please apply those safety requirements as site or situation dictate. NOTE: All City project representatives who assume responsibility for contract management will be responsible for ensuring compliance with these safety requirements by all Contractors and/or Subcontractors.
 - 1. General: The Contractor shall comply with all Federal/State Occupational Safety and Health Act (OSHA) Standards and any other rules and regulations applicable to construction and/or maintenance activities in the State of Florida. The Contractor shall also comply with County, City, or any other agency's rules and regulations regarding safety.
 - 2. Trenching and excavation shall comply with the OSHA 29CFR 1926 Subpart P final rule and the State of Florida Trench Safety Act.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Engineer shall schedule and administer a preconstruction conference, monthly project meetings, and any specially called meetings throughout the progress of the Work. The Contractor shall:
 - 1. Prepare and distribute notification of meeting to attendees for meetings.
 - 2. Prepare agenda.
 - 3. Make physical arrangements for meetings.
 - 4. Preside at meetings
 - 5. Prepare, record, and distribute minutes of the meetings.
- B. Representatives of Contractor, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.02 PRECONSTRUCTION CONFERENCE

- A. The preconstruction conference will be scheduled by Engineer as outlined in Division 0.
- B. Location: North WRF.
- C. Attendance (as applicable).
 - 1. Owner representatives, and their professional consultants.
 - 2. Engineer representatives and their professional consultants.
 - 3. Contractor's representative and Contractor's professional consultants.
 - 4. Contractors and Suppliers
 - 5. Others as appropriate

D. Suggested Agenda:

1. Introduction of attendees.
2. Explanation of each party's responsibilities.
3. Formal notification of any items in the Contract that are to be announced at this time (name of Engineer, etc.).
4. Other agency requirements (EPA, FDEP, Water Management District, Corps, etc.).
5. Discussion of Construction Site
 - a. Mobilization – Contractor's office
 - b. Site access-storage and lay down areas
 - c. Temporary Utilities
 - d. Clean-up
6. Project Layout, Survey and Controls
7. Contract Data
 - a. Date of Notice to Proceed
 - b. Date of Substantial Completion
 - c. Date of Final Completion
 - d. Liquidated damages
8. Submittals prior to Construction
 - a. Preliminary Schedule
 - b. Schedule of Shop Drawing Submissions
 - c. Schedule of Values
9. Permits
10. Hours of Work and Holidays
11. Correspondence - All correspondence will be transmitted to the Engineer with copy to Owner.

12. Contractor submissions
 - a. Substitutions
 - b. Shop Drawings - No work until approved
 - c. Monthly Progress Photographs
13. Construction Schedule
14. Record Documents
15. Application for Payments
16. Schedule and review requirements for Progress Meetings
17. Procedures and processing of:
 - a. Field decisions
 - b. Proposal requests
 - c. Change Orders and Change Authorizations
 - d. Requests for Information
18. Substantial Completion and Final Inspection
19. Safety and First Aid
20. Adequacy of distribution of Contract Documents
21. Emergency Contact List
22. Security
23. Project Inspection requirements by the City of Sanford
 - a. Miscellaneous non-scheduled daily inspection
 - b. The City shall be given 48-hour advanced notice to schedule required inspections
24. Labor requirements.
25. Laboratory testing of material requirements.
26. Inventory of material stored on site.

27. Requirements of utility owners and other organizations.
28. Housekeeping procedures.
29. Posting of signs.
30. Check of required Bond and Insurance certifications.
31. Guarantee on completed work.

1.03 PROJECT MEETINGS

- A. Engineer will schedule regular meetings. The project meetings may be held monthly or as required by progress of the work with the first meeting four weeks after the preconstruction meeting. Contractor will prepare and distribute the minutes of the progress meetings.
- B. Location of the meetings: North WRF.
- C. Attendance:
 1. Owner Representatives as needed.
 2. Contractor and his consultants as needed.
 3. Engineer and his professional Consultants as needed.
 4. City or County Representatives as needed.
 5. Subcontractors as appropriate to the agenda.
 6. Suppliers as appropriate to the agenda.
 7. Others as appropriate.
- D. Suggested Agenda:
 1. Review and approval of minutes of previous meeting.
 2. Citizen complaints and concerns.
 3. Review of work progress since previous meeting.
 4. Field observations, problems, conflicts.
 5. Problems which impede design and construction schedule.
 - a. Labor

- b. Material Deliveries
 - c. Equipment
 - d. Sub-agreements
- 6. Review of off-site fabrication and delivery schedules and expediting status.
- 7. Corrective measures and procedures to regain projected schedule.
- 8. Revisions to schedule.
- 9. Progress schedule during succeeding work period.
- 10. Coordination of schedules.
- 11. Contractor Submissions
 - a. Shop drawings
 - b. Working drawing
 - c. Certificates of Compliance
 - d. Test results or Catalogue cut sheets
- 12. Maintenance of quality standards.
- 13. Pending changes and substitutions.
- 14. Review proposed changes for:
 - a. Effect on Construction Schedule and completion date.
 - b. Effect on other contracts of the Project.
- 15. Maintenance of Contract Documents
- 16. Other business.
- 17. Action Assignments
 - a. Recap, previously assigned unaccomplished tasks
- 18. Location and time of next meeting.
 - a. Recap new assignments from this meeting.

- E. Contractor representative is to attend the project meetings and have the authority to act on behalf of the entity he represents on field related matters. Contractor representative is to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics such as minutes correction, deliveries of materials and equipment, progress of the Work, etc.
- F. The Contractor is to provide a current submittal log at each progress meeting in accordance with the General Conditions.
- G. The Contractor is to provide a two-week schedule at each project meeting in accordance with the General Conditions.

1.04 SPECIAL MEETINGS

- A. Special Meetings as may be called by Engineer.
 - 1. Agenda: As necessary
 - 2. Attendance: As appropriate

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01310

PROJECT SCHEDULE USING CPM NETWORK ANALYSIS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Contractor's progress schedule shall consist of a network analysis system as described herein. In preparing this system the scheduling of the construction is the responsibility of the Contractor. Conventional Critical Path Method (referred to as CPM) techniques must be utilized to satisfy both time and cost applications. The principles and definitions of the terms used herein shall be as set forth in the AGC publication "The Use of CPM in Construction", but the provisions of this Section shall govern.
- B. The primary objectives of the CPM scheduling requirements are:
 - 1. To ensure adequate planning and execution of the Work by the Contractor;
 - 2. To assist the Owner in evaluating progress of the Work;
 - 3. To provide for optimum coordination by Contractor of his trades and Subcontractors for his Work, and for the work or services provided by any separate contractors;
 - 4. To permit the timely prediction or detection of events or occurrences which may affect the timely prosecution of the Work; and
 - 5. To provide a mechanism or tool for use by the Owner, Engineer and Contractor in determining and monitoring any actions of the Contractor which may be required in order to comply with the requirements of the Contract Documents relating to the completion of the various portions of the Work in the Contract Time specified in the Contract Documents.
- C. Contractor is responsible for determining the sequence of activities, the time estimates of the detailed construction activities and the means, methods, techniques and procedures to be employed. The Construction Schedule shall represent the Contractor's best judgment of how he will perform the Work in compliance with the Contract Documents. Contractor shall ensure that the Construction Schedule is current and accurate and is properly and timely monitored, updated and revised as Project conditions and the Contract Documents may require.
- D. Contractor shall consult with his Subcontractors (and suppliers) relating to the preparation of his construction plan and Construction Schedule. Subcontractors shall receive copies of those portions of Contractor's Construction Schedule which relate to their work and shall be continually advised of any updates or revisions to the Construction Schedule as the Work progresses.

- E. When Contractor submits his Construction Schedule to the Engineer or makes any proposed updates or revisions to such Schedule, it will be assumed by the Owner and Engineer that Contractor has consulted with and has the concurrence of his Subcontractors. Contractor shall be solely responsible for ensuring that all their portions of the Work.
- F. It is understood and agreed that the Construction Schedule is to represent Contractor's best plan and estimate for the Work; however, Contractor acknowledges that the Construction Schedule may have to be revised from time-to-time as progress proceeds. Contractor further acknowledges and agrees that the Owner and Engineer do not guarantee that:
 - 1. Contractor can start work activities on the "early start" or "late start" dates or complete work activities on the "early finish" or "late finish" dates shown in the Schedule, or as same may be updated or revised;
 - 2. Contractor can proceed at all times in the sequence established by the utilization of only the resources and manpower it initially planned for the performance of the Work;
 - 3. Contractor's Construction Schedule will not have to be modified or changed by direction of the Owner and the Engineer. Any changes, modifications or adjustments made by Contractor to the Construction Schedule shall be in full compliance with all requirements of the Contract Documents.
- G. The Contractor acknowledges and agrees that its Construction Schedule must be flexible in order to accommodate and allow for his coordination with the operation of the Owner and the work of separate contractors relating to the Project. The Engineer will review the Contractor's Construction Schedule for compatibility with Owner's operations and, if appropriate, the work of separate contractors. Contractor agrees to hold meetings with the Owner and separate contractors to resolve any conflicts and to revise his Construction Schedule as reasonably required.

1.02 FORM AND CONTENT OF SCHEDULES

- A. The Contractor shall utilize Primavera Project Planner and Primavision software as supplied by Primavera Systems, Inc., Bala Cynwyd, PA, or Microsoft Project.
- B. The format of the CPM network analysis schedule shall consist of time scaled network logic diagrams and accompanying schedule reports generated by the Primavera systems software, a computer, printer and plotter.
- C. The computer generated schedule reports shall be on either 8 1/2 x 11 inch paper or 11 x 17 inch paper.
- D. The logic diagrams shall show the order and interdependence of activities and the sequence in which the Work is to be accomplished as planned by the Contractor. The Basic concept of network analysis diagram shall be followed to show how the start of a

given activity is dependent on the completion of preceding activities and how its completion restricts or restrains the start of following activities.

- E. In addition to construction activities, detailed network activities shall include the submittal process, the procurement of materials and equipment, the receipt of materials with procurement costs, and testing. All activities of the Owner that affect progress and required dates for completion of all or parts of the Work shall be shown. Activities indicating Owner furnished materials and equipment shall be shown. Detailed networks shall be time-scaled and plotted to show continuous flow from left to right with no arrows from right to left. The following information shall be shown on the diagrams for each activity:
 - 1. Predecessor and successor activity numbers.
 - 2. Description of the activity.
 - 3. Total float in workdays.
- F. Numbering shall be assigned so that predecessor activity numbers are smaller numerically than the successor activity numbers. Skip numbering shall be used on the network to allow insertion of additional activities for change orders and logic changes. The activities shall be arranged and sorted in keeping with the activity codes describe in Article 2.4 of this Specification Section.
- G. The computer-generated schedule reports shall include a tabulation of each activity shown on the detailed network diagrams.
- H. The following information shall be furnished as a minimum for each activity.
 - 1. Predecessor and successor activity numbers
 - 2. Activity description
 - 3. Original duration of activity (workdays)
 - 4. Early start date (by calendar date)
 - 5. Early finish date (by calendar date)
 - 6. Actual start date (by calendar date)
 - 7. Actual finish date (by calendar date)
 - 8. Late start date (by calendar date)
 - 9. Late finish date (by calendar date)
 - 10. Total float (workdays)

I. Construction Activities

1. Schedule shall show dates for beginning of and completion of each major element of construction and an indication of how long treatment component will be off-line for approval.
- J. Activity durations shall be in whole working days. No activity except procurement duration shall exceed 15 working days without the Engineer's approval.
- K. Float or slack time is not for the exclusive benefit of either the Owner or Contractor. Extensions of time for performance as specified in the Contract Documents will be granted only to the extent that equitable time adjustments for the network activity or activities affected exceed the total float or slack time along the affected network paths as shown in the graphic arrow diagram and computer printout report in effect at the instant of either: (a) a notice to proceed with a change, (b) a notice of suspension of Work, or (c) detection of subsequently acknowledged differing site condition.
- L. Further, use of float time in the Schedule, or the allocation of float time to activities by means of special logic restraints or imposed dates, shall be shared to the benefit of the Owner and the Contractor.
- M. The currently accepted Schedule shall have legal status as long as it is used by Contractor for planning, organizing, directing, managing, and executing the Work in accordance with the Contract Documents. Legal status will also imply that Contractor will use the Schedule to report progress and for determining delays in achieving the Project completion dates(s) stipulated in the Agreement subject to the requirements of this Specification Section. Contractor acknowledges and agrees that actual slippage to the activities shall not be the basis for an adjustment in Contract Time unless the causes of slippage are excusable as per Specification Section 00700, Article 15, and such slipped activities are on the critical path of the currently accepted work plan and result in a delay achieving the Project completion date(s) specified in the Agreement.

1.03 PRELIMINARY & COMPLETE SUBMITTAL AND ACCEPTABLE

- A. Preliminary Meeting: If requested by the Engineer, the Contractor shall participate in a preliminary meeting to discuss the proposed Schedule and requirements of this Section prior to submission of the network.
- B. Preliminary Schedule: A preliminary time-scaled network and printouts defining the contractor's planned operations during the first 90 calendar days shall be submitted within 30 calendar days after receipt of Notice of Award but no later than the Preconstruction Conference. The Contractor's general approach for the balance of the Project shall be indicated. Cost of activities expected to be completed or partially completed before submission and acceptance of the Complete Schedule should be included. Both the Preliminary Network Diagrams and Required Reports listed in paragraph 3.1.4 shall be submitted. The Preliminary Schedule may be used for requesting progress payments for a period not to exceed 90 calendar days after receipt

of Notice of Award. Payment requests after this first 90 calendar day period must be based upon the accepted Complete Schedule.

- C. Complete Schedule: The Complete Schedule network analysis showing all activities in the Work Shall be submitted within 60 calendar days after receipt of Notice of Award.
- D. The Contractor shall participate in meetings to discuss the Engineer's review and evaluation comments on the proposed Preliminary and Complete Schedule network diagrams and reports as well as any Schedule updates. Any necessary revisions shall be submitted in the requisite format and number of copies as required for the original submission for review by the Engineer.
- E. Once reviewed and accepted, the Schedule shall then be used by the Contractor for planning, organizing, and directing the Work, reporting progress, demonstrating the impact of changes, and requesting payment for work accomplished. If the Contractor thereafter desires to make changes to activity data or the schedule logic or to add or delete activities other than the routine changes made monthly to update progress, the Engineer shall be notified in writing prior to the next schedule update stating the reasons for the changes. If the Engineer considers these changes to be of a major nature, the Contractor may be required to submit revise time-scaled network logic diagrams, required reports, and data diskettes for review by the Engineer at no additional cost. A change is considered major in nature if it is not readily apparent that the change could have no affect on the projected completion date for all or any portion of the Work.

1.04 ANALYSIS FOR CHANGE ORDERS, DELAYS, AND CONTRACTOR REQUESTS

- A. When Change Orders are proposed or issued, delays are experienced, or the Contractor desires to revise the Project Schedule, the Contractor shall submit to the Engineer a written Time Impact Analysis illustrating the influence of each Change Order (whether proposed or issued), delay, or Contractor request on the Contract Time. Each Time Impact Analysis shall include a fragmentary network (Network analysis) demonstrating how the Contractor proposes to incorporate the proposed or issued Change Order, delay or Contractor request into the Project Schedule. The Time Impact Analysis shall demonstrate the time impact based on the date the change order is given to the Contractor or the date the delay occurred; the status of construction at that point in time; and the time computation of all affected activities. The event times used in the Time Impact Analysis shall be those included in the latest Project Schedule Update or as adjusted by mutual agreement.
- B. Activity delays shall not automatically mean that an extension of the Contract Time is warranted or due the Contractor. It is possible that a Change Order or delay will not affect existing critical activities or cause non-critical activities to become critical. A Change Order or delay may result in only absorbing a part of the available total float that may exist within an activity chain of the Schedule Network, thereby not causing any effect on the Contract Time.

- C. In the event of a work delay, the Time Impact Analysis shall be submitted within 30 calendar days after occurrence of the delay or after issuance of any unilateral Change Order. The Analysis shall be submitted concurrently with the supporting data for a proposed Change Order.
- D. Upon review by the Engineer without notes of exception, the Time Impact Analysis shall be returned to the Contractor and incorporated into the Project Schedule at the next monthly Schedule update.
- E. The Time Impact Analysis related to an extension of any Change Order shall be incorporated into and attached to the applicable Change Order(s).

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01340

SHOP DRAWINGS AND SUBMITTALS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. In accordance with the General Conditions Contractor shall submit a detailed list of data on items for which shop drawings, construction drawings, and samples are to be submitted. Included in this list shall be the names of all proposed Suppliers furnishing specified items. Review of this list by Engineer shall not relieve Contractor from submitting complete drawings and data and providing materials, equipment, etc., fully in accordance with the Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Division 0: General Conditions

1.03 CONTRACTOR RESPONSIBILITY:

- A. All submittals shall be in accordance with the General Conditions and accompanied by a transmittal form containing at least the following information:
 - 1. Date.
 - 2. Project Title and Number.
 - 3. Contractor's name and address.
 - 4. The number and revision of each drawing submitted.
 - 5. Notification of Deviations from Contract Documents.
 - 6. Submittal Log Number.
 - 7. Specification title and number.
- B. Be responsible for and bear costs of damages which may result from the ordering of material or from proceeding with any part of work prior to the completion of the review by Engineer of the necessary submittals unless otherwise authorized by Engineer in writing.
- C. Notify Engineer of the need for making any changes in or manner of the installation which may be required by the materials/equipment which Contractor proposes to supply, both as it concerns his own work, or any work affected under other parts, headings, or divisions of drawings and specifications.

- D. Shall submit six (6) copies with original stamping on each copy.
- E. All shop drawings shall be submitted to Engineer within 60 days of Notice of Award. Progress payments may be withheld until receipt of all submittals at Owner's discretion.

1.04 ENGINEER'S REVIEW

- A. Submittals will be reviewed in accordance with the General Conditions.
- B. Re-submittals will be handled in the same manner as first submittals. On resubmittals Contractor shall direct specific attention, in writing or on resubmitted drawings, to revisions other than the corrections requested by Engineer on previous submissions. Contractor shall make any additional corrections or clarifications required by Engineer.
- C. If Contractor considers any correction indicated on the drawings to constitute a change to the Contract Documents, Contractor shall give written notice thereof to Engineer.
- D. No partial submittals will be reviewed. Submittals not complete will be returned to Contractor for resubmittal.
- E. All drawings, schematics, manufacturer's product data, certifications and other drawing submittals required for a system specification shall be submitted at one time as a package to facilitate interface checking.

1.05 SHOP DRAWINGS AND DATA

- A. Shop Drawings, as defined in the General Conditions, shall complement design and construction drawings, but shall contain sufficient detail to clearly define all aspects of the construction. These drawings shall be complete and detailed.
- B. Contractor or Supplier's catalog sheets, brochures, diagrams, illustrations and other standard descriptive data shall be clearly marked with specification title and numbers to identify pertinent materials, product or models. Delete information which is not applicable to the Work by striking or cross-hatching.
- C. Each Shop Drawing shall have a blank area located adjacent to the title block. The title block shall display the following:
 - 1. Project Title and Number
 - 2. Number and title of the shop drawing
 - 3. Date of Shop drawing or revision
 - 4. Name of Contractor and subcontractor submitting drawing
 - 5. Supplier/Manufacturer

6. Separate detailer when pertinent
 7. Specification title and number
 8. Drawing number
- D. If shop drawings show variations from Contract requirements because of standard shop practice or for other reasons, Contractor shall describe such variations in his letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. If Contractor fails to describe such variations, Contractor shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such drawings have been reviewed.
- E. Data on materials and equipment shall include, without limitation, materials and equipment lists, catalog data sheets, cuts, performance curves, diagrams, verification of conformance with applicable standards or codes, materials of construction and similar descriptive material. Materials and equipment lists shall, for each item, give: the name and location of the Supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.
- F. For all mechanical and electrical equipment furnished, Contractor shall provide a list including the equipment name, address and telephone number of the Supplier's representative and service company so that service and/or spare parts can be readily obtained.
- G. Contractor will obtain an installation list from suppliers and equipment suppliers who propose to furnish equipment or products for submittal to ENGINEER along with the required shop drawings. The installation list shall include at least five installations where identical equipment has been installed and has been in successful operation for a period of at least one year.

1.06 CONSTRUCTION DRAWINGS

- A. The term "construction drawings" shall be considered to mean Contractor's plan for temporary structures such as temporary construction fencing, support of open cut excavation, support of utilities, ground water control systems, forming and false work; for underpinning; and for such other work as may be required for construction but which does not become an integral part of the project.
- B. Copies of construction drawings shall be submitted to Engineer at least 30 calendar days (unless otherwise specified by Engineer) in advance of their being required for work.
- C. Construction drawings shall be signed by a registered Professional Engineer or Architect, currently licensed to practice in the State of Florida, and shall convey or be accompanied by, calculations or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use. Prior to commencing such work, construction drawings must have been reviewed without specific exceptions by Engineer, which review will be for general conformance and will not relieve

Contractor in any way from his responsibility with regard to the fulfillment of the terms of the Contract. All risks to new or existing work are assumed solely by Contractor. Engineer review of the construction drawing assumes no responsibility for construction drawing design or implementation by Engineer or Owner.

1.07 SAMPLES

- A. Contractor shall furnish, for the approval of Engineer, samples required by the Contract Documents or as may be reasonably requested by Engineer. Samples shall be delivered to Engineer as directed. Contractor shall prepay shipping charges on samples. Materials or equipment for which samples are required shall not be used in Work until approved by Engineer.
- B. Provide two of each requested sample, unless directed otherwise. Samples shall be of sufficient size to clearly illustrate:
 - 1. Functional characteristics of the product, with integrally related parts and attachment devices.
 - 2. Full range of color, texture and pattern.
- C. Each sample shall have a label indicating:
 - 1. Name of Project.
 - 2. Name of Contractor and subcontractor.
 - 3. Material or equipment represented.
 - 4. Place of origin.
 - 5. Name of producer and brand (if any).
 - 6. Location in Project.
 - 7. Specification title and number.
 - 8. Submittal number.

Note: Samples of finished materials shall have additional marking that will identify them under the finish schedules.
- D. Contractor shall prepare a transmittal letter, in triplicate for each shipment of samples, containing the information required in paragraph II.E.3. Contractor shall enclose a copy of this letter with the shipment and send a copy of this letter to Engineer. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any Contract requirements.

- E. Approved samples not destroyed in testing shall be sent to Engineer or stored at the site of the Work. Approved samples of the hardware in good condition will be marked for identification and may be used in the Work. Materials and equipment incorporated in the work shall match the approved samples. Samples which failed testing or were not approved will be returned to Contractor at his expense, if so requested at time of submission.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01370

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. In accordance with the General Conditions and this Section, Contractor shall prepare and submit a Schedule of Values. The Schedule of Values shall be used as the basis of Contractor's Application for Payment. The Contractor will be required to submit the Schedule of Values prior to issuance of the project Notice of Award.

1.02 SUBMITTALS:

- A. Contractor shall submit Schedule of Values on forms containing information needed to support applications for payment. Identify the schedule with:
 - 1. Contract Title and Project Name, if applicable.
 - 2. Name and Address of Contractor.
 - 3. Date of submission.
- B. The Schedule of Values shall list the installed value of the component parts of Unit Cost and Lump Sum Work in sufficient detail to serve as a basis for computing values for Progress Payments during construction:
 - 1. The division of unit cost and lump sum items into component parts shall be chosen to accommodate measuring actual progress in the field, such that progress measurement can be objective and verifiable. Appropriate units shall be used for each line item.
 - 2. Identify each component part with the number and title of the respective major section of the Specifications. For each major component part list sub-component values of major products, operations or work areas under the item.
 - 3. For each of the various component parts of the Work, include a directly proportional amount of Contractor's overhead and profit. No separate line items shall be allowed for Contractor's field or home office overhead or profit.
- C. The form of the Schedule of Values shall parallel the form presented in Section 00845.
- D. Engineer will review for approval and return Schedule of Values submittals in accordance with the General Conditions. If requested by Engineer, Contractor shall support amounts indicated on the Schedule of Values with data such as executed Sub-

agreements, which will substantiate the correctness of the values, or revise values Engineer deems inappropriate.

- E. Contractor shall revise and resubmit, and ENGINEER shall review for approval, the Schedule of Values to incorporate Change Orders executed by the Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS AND AUDIO-VIDEO PRECONSTRUCTION DOCUMENTATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section outlines in general the work necessary to provide a continuous color audio-video tape recording prior to and during construction to serve as a record of pre-construction conditions, as well as to document certain milestones and periodic color photographs during the course of construction.

1.02 RELATED REQUIREMENTS

- A. Section 01010: Summary of Work

1.03 QUALIFICATIONS

- A. The pre-construction audio-video recording shall be of a professional quality that will clearly log an accurate visual description of existing conditions. The recording shall be on a high-quality DVD. The audio-visual recording shall clearly show the date and time of recording. Any portion of the video not acceptable for the determination of the existing condition shall be re-recorded at no additional cost to the Owner.
- B. Employ competent photographer to take color digital construction record photographs periodically during course of the work.

1.04 SCHEDULING

- A. The audio-visual taping shall be done and furnished to the Owner a minimum of one week prior to placement of materials or equipment in any of the construction or construction access areas.

1.05 PHOTOGRAPHY REQUIRED

- A. Construction photographs taken to satisfy the requirements of the Specifications shall be submitted with each scheduled Application for Payment.
- B. Provide photographs taken at each major stage of construction.

C. Photographs

1. Photographs shall be in digital format.
 - a. Two (2) CDs of photographs shall be submitted.
 - b. Photos shall not be copyrighted.
2. Identify each photograph listing the following with submittal of CD:
 - a. Name of Project.
 - b. Orientation of view.
 - c. Date and time of exposure.
 - d. Name and address of photographer.
 - e. Photographer's numbered identification of exposure.

1.06 COSTS OF PHOTOGRAPHY

- A. Contractor shall pay costs for specified photography and CD. Parties requiring additional photography will pay photographer directly.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PRECONSTRUCTION AUDIO-VIDEO RECORDING

- A. Technique
 1. Factual presentation.
 2. Correct exposure and focus.
 - a. High resolution and sharpness.
 - b. Maximum depth-of-field.
 - c. Minimum distortion.

B. Coverage

1. The recording coverage shall include:
 - a. Pre-construction recording of the headworks structure.

C. Visibility

1. The DVD shall be recorded, and photographs taken, during a time of good visibility. Recordings or photographs shall not be made during periods of precipitation or when conditions are obscured.

D. Video Identification and Security

1. All video recordings shall be permanently labeled and shall be properly identified by video number and project title.
2. To preclude the possibility of tampering or editing in any manner, all recordings must, by electronic means, display continuously and simultaneously generated transparent digital information to include the date and time of recording. The date information shall contain the month, day and year. The time information shall consist of hours, minutes and seconds, separated by colons. For example, 13:24:10. This transparent information shall appear on the screen.

E. DVD Recorder Operation

1. DVD Recorder Height and Stability: When conventional wheeled vehicles are used as conveyances for the recording system, the vertical distance between the camera lens and the ground shall not exceed 10 feet. The DVD recorder shall be firmly shock mounted such that the transport of the recorder during the recording process will not cause an unsteady picture.
2. DVD Recorder Control: DVD Recorder pan, tilt, zoom-in and zoom-out rates shall be sufficiently controlled such that recorded objects will be clearly viewed during DVD playback. In addition, all other recording system controls, such as lens focus and aperture, video level, pedestal, chroma, white balance, and electrical focus shall be properly controlled or adjusted to maximize picture quality.
3. Viewer Orientation Technique: The audio and video portions of the recording shall maintain viewer orientation through the entire area of proposed construction.

3.02 CONSTRUCTION PHOTOGRAPHS

A. Photograph Views and Quantities Required

1. Photograph from locations to adequately illustrate condition of construction.

- a. Consult with Engineer at each period of photography for instructions concerning views required.

3.03 DELIVERY OF PHOTOGRAPHS

- A. Color audio-video DVDs to be kept by Engineer and delivered to Owner with project record documents.
- B. Deliver CD to Engineer to accompany each Application for Payment.

END OF SECTION

SECTION 01410

TESTING AND TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Contractor shall employ and pay for services of an independent testing laboratory to perform soils and concrete testing. The testing laboratory is subject to approval by the Engineer.
2. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.

B. Related Requirements Described Elsewhere:

1. Conditions of the Contract.
2. Respective section of the Specifications: Certification of products.
3. Each Specification section listed: Laboratory tests required, and standards for testing.
4. Testing laboratory inspection, sampling and testing is required for, but not limited to the following:
 - a. Excavating, Backfilling, and Compaction.
 - b. Cast-in-Place Concrete.

C. The following schedule defines the responsibilities of various tests.

Test	Notes	Paid for By
Soil Compaction	Pipe Work: every 300 ft. at each lift of compaction minimum. Beneath Structures: each 500 SF each lift of compaction minimum.	Contractor
Bacteriological	As required by local and State agencies.	Contractor
Concrete	Slump test each delivery and compression test five cylinders every 50 C.Y. minimum.	Contractor

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with Owner's personnel and laboratory personnel. Provide access to Work and manufacturer's operations.
- B. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.
- C. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacturer or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The Engineer may require the Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the Owner shall be allowed on account of such testing and certification.
- D. Furnish incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To facilitate inspections and tests.
- E. Notify Owner a minimum of three (3) working days in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.01 POTABLE AND RECLAIMED WATER

- A. Potable water will be provided by the City to the Contractor at no charge for construction purposes including potable and sanitary uses, testing, and cleaning. The Contractor will be responsible for costs of installation of connections, piping, and valves required to connect to the City system route water where needed by the Contractor. The Contractor will install a water meter at the connection point to the City system if a meter is provided by the City. Contractor will be required to obtain a hydrant meter by contacting customer service. A deposit for the meter is required. The City will not charge for the water used however; the contractor must use the hydrant meter for all water usage.
- B. Reclaimed water will be provided to the Contractor at no charge for construction purposes. The Contractor will be responsible for all costs associated with installation of piping, valves, and connections necessary to convey reclaimed water from existing plant piping to the Contractor's required location.
- C. The Contractor shall install temporary water service, including locating piping and outlets to:
 - 1. Provide service convenient to workstations, including the exterior work bench.
 - 2. Avoid interference with:
 - a. Traffic and work areas.
 - b. Materials handling equipment.
 - c. Storage areas.
 - 3. The Contractor shall ensure that pipes are not located on floor or on ground.
 - 4. Modify and extend service as work progress requires.

1.02 ELECTRIC POWER

- A. The City will pay for the cost of power used in connection with the construction work. Such power shall be obtained from existing outlets. Acceptable uses include the following.

1. Power centers for miscellaneous tools and equipment used in construction work.
 2. Power for construction equipment.
 3. Power for testing and checking equipment.
 4. Power for welding units and for other equipment having special power requirements.
 5. Power for Contractors, Subcontractors and Owner/Engineer's field offices.
- B. Costs of Installation and Operation: The Contractor shall arrange and pay costs of installation, maintenance, and removal of temporary services from point of connection.
- C. Capacity:
1. Adequate electrical service for construction use by all trades during construction period.
 2. Notify Power Company and the City if unusually heavy loads such as welding, and other special power requirements, will be connected.
 - a. Provide special circuits for heavy load requirements.
 - b. Do not overload any circuit.
- D. The Contractor shall maintain strict supervision of use of temporary services:
1. Enforce conformance with applicable standards.
 2. Enforce safe practices.
 3. Prevent abuse of services.
- E. The Contractor shall comply with the requirements of regulatory agencies:
1. Obtain and pay for permits as required by governing authorities.
 2. Comply with applicable codes.
 - a. National Electrical Code.
 - b. National Electrical Safety Code.
 - c. National Fire Protection Association.
 - d. Federal, state, and local codes and utility company regulations.

1.03 TELEPHONE

- A. The Contractor shall arrange telephone companies, if necessary, to obtain temporary service for construction purposes. The Contractor shall pay all telephone company installation and use charges for the telephone service.

1.04 SANITARY FACILITIES

- A. The Contractor shall provide and maintain temporary sanitary accommodations for the use of his employees and those of his subcontractors as may be necessary to comply with health requirements and regulations and as directed by the Engineer. No nuisance will be permitted from these accommodations.
- B. The Contractor shall pay the costs of temporary sanitary facilities, including costs of installation, maintenance, and removal. The Contractor shall pay service charges for use of portable sanitary units.
 - 1. The Contractor shall provide enclosures for toilet facilities at each site:
 - a. Weatherproof, sightproof, sturdy temporary enclosures.
 - b. Insect-proof screening, adequate natural ventilation.
 - 2. The Contractor shall ensure that sanitary facilities are clean and maintained at all times.
 - a. Sanitary facilities shall be serviced by the supplier, at a minimum, twice per work week.

1.05 TEMPORARY BUILDINGS

- A. The Contractor shall provide on-site temporary buildings, construction offices, or other structures used for storage. The Contractor is responsible for securing storage facilities and offices.
- B. Location of construction trailers, storage buildings, and staging areas must be pre-approved by the Owner.

1.06 CLEAN-UP

- A. Upon completion of daily work, all excess material and rubbish shall be removed from the job site, and any off-site locations used, and disposed of in a lawful manner and in accordance with the Contract Documents. The surrounding construction area and any other affected grounds shall be left in a condition as good or better than existed prior to construction. Any remedial actions, measures or reconstruction of damaged properties shall be accomplished at the Contractor's expense.

1.07 USE OF PREMISES

- A. The Contractor shall confine his apparatus and the storage of materials to area permitted by laws, ordinances, permits, or directions of the Engineer and shall not unduly encumber the project route area with his materials.

1.08 ACCESS ROADS

- A. Streets, roads, and drives used by the Contractor for access to and from the site of the work shall be protected from damage. Any such damage done shall be repaired and left in good condition at the end of the construction period. Upon completion of construction, access areas and temporary easements shall be restored to the pre-construction condition at no additional cost to the Owner.

1.09 MAINTENANCE DURING CONSTRUCTION

- A. The Contractor shall maintain, at his expense, the work during construction and until final acceptance of all work under the contract.
- B. In the event the Contractor fails to remedy any unsatisfactory situation within twenty-four (24) hours after receipt of written notice from the Engineer describing the unsatisfactory conditions, the Owner may immediately proceed with adequate forces and equipment to maintain the project, and the entire cost of this maintenance will be deducted from the monies otherwise due the Contractor under the Contract.
- C. As an alternative to the above specified maintenance, the cost of all of the items that are not properly maintained may be deducted at the Contract Prices from the current partial payment request even if such items have been paid for in previous estimates.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01520

MAINTENANCE OF FACILITIES AND SEQUENCE OF CONSTRUCTION

PART 1 - GENERAL

1.01 GENERAL

- A. The Contractor shall continuously maintain wastewater flow and treatment. A general sequence of construction is set forth on the Drawings. This sequence provides only general guidance. The Contractor must schedule and complete the work, and provide temporary facilities as needed to maintain treatment.

1.02 CONSTRUCTION SCHEDULE

- A. The Construction Schedule shall be submitted by the Contractor in accordance with Section 01340 of these Specifications.

1.03 USE OF FACILITIES BEFORE COMPLETION

- A. The City reserves the right to enter and use any portion of the constructed facilities before final completion of the whole work to be done under this Contract.

1.04 CONNECTION OF EXISTING SYSTEMS

- A. All connections to existing systems shall be performed in such a manner that no damage and no interruptions are caused to the existing system. On completion of its installation, the Contractor shall complete connections to the existing systems in a proper manner. Any damage caused to existing installations shall be repaired or replaced by the responsible Contractor at no additional cost to the City.

1.05 COORDINATION WITH CITY PERSONNEL

- A. Before commencing work involving removing or placing in operation existing or new facilities or tie-ins to existing facilities, the Contractor shall notify the City at least three (3) business days in advance in writing. The City shall be responsible for removing facilities from operation as deemed necessary.
- B. The Contractor shall, under no circumstances, interfere with the existing wastewater treatment, residuals processing systems, utilities and other facilities without the City's or other jurisdictional authorities' authorizations, in writing, and supervision. The Contractor shall notify the City's representative in writing a minimum of three (3) work days prior to each scheduled service request. This notification shall be provided in writing by the Contractor.

1.06 GENERAL SEQUENCE OF CONSTRUCTION AND OPERATION REQUIREMENTS

- A. Work under the Contract shall be scheduled and performed in such a manner as to result in the least possible disruption to the use of roadways.
- B. The outlined sequence of construction does not include all items necessary to complete the work but is intended to identify the sequence of critical events necessary to minimize any disruptions and to avoid any impact to continued wastewater treatment and residuals handling services. It shall be understood by the Contractor that the critical events identified are not all inclusive and that additional items of work not shown may be required. The sequence of construction is a precedence requirement and does not attempt to schedule the Contractor's work. It is intended only to indicate which activities must precede other activities.
- C. All work by the Contractor that disrupts the normal wastewater treatment, residuals handling, or utilities operations shall be shown on the Construction Schedule specified in Section 01340 and specifically scheduled with the City. Schedule notification shall consist of a written notice defining the work to be accomplished, the potential duration of the interruption, and the mitigating effort to be performed by the Contractor. The written notice shall be submitted to the City fourteen days in advance of the proposed work and the City will respond to the Contractor in writing within seven days of receipt of the notice regarding the acceptability of the proposed plan.
- D. At no time, will the Contractor be allowed to close off any pipelines, or open any valves, or take any other action which would affect the operation of the existing processes or utilities, except as specifically required by the drawings and specifications, and until authorization is granted by the City or Engineer and after proper notification has been provided.
- E. Temporary installations required to complete a particular aspect of the work during the allowed time period shall be determined by the Contractor and implemented by the Contractor at no additional cost to the City. All such temporary installations shall be subject to review and acceptance.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 COORDINATION WITH EXISTING UTILITIES AND OTHER AGENCIES

- A. The Contractor shall coordinate with Sunshine One-Call Notification at 811 minimum of 48 business hours prior to any excavation for location of existing underground facilities. Permit requirements for notifications to all jurisdictional agencies within the work limits must be adhered to by the Contractor.

3.02 COOPERATION

- A. The Contractor shall allow the City or its agents, and other project contractors or their agents, to enter facilities being constructed under this Contract for the purpose of constructing, installing, operating, maintaining, removing, repairing, inspecting, reviewing, altering or replacing such equipment pipes, sewers, conduits, manholes, wires, or other structures which may be required to be installed at or in the work area.
- B. The Contractor shall cooperate with all the aforesaid parties and shall allow reasonable provisions for the execution of any other work by the City, or others, to be done in connection with his work, or in connection with normal use of the facilities.

END OF SECTION

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SECTION 01525

CONSTRUCTION AIDS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish, install and maintain required construction aids, remove on completion of Work.
- B. Related Requirements Described Elsewhere:
 - 1. Summary of Work: Section 01010.
- C. Comply with applicable requirements specified in Sections of Divisions 2 through 16.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required by personnel and to facilitate execution of the Work: scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment such as temporary valves and fittings. Refer to respective Sections for particular requirements for each trade.
- B. When permanent stair framing is in place, provide temporary treads, platforms and railings, for use by construction personnel.
- C. Maintain facilities and equipment in first-class condition.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Consult with the Engineer, review site conditions and factors which affect construction procedures and construction aids, which may be affected by execution of the Work.

3.02 GENERAL

- A. Comply with applicable requirements specified in sections of Divisions 2 through 16.
- B. Relocate construction aids as required by progress of construction, by storage of work requirements and to accommodate legitimate requirements of Owner and other contractors employed at the site.

3.03 REMOVAL

- A. Completely remove temporary materials, equipment and services:
 - 1. When construction needs can be met by use of permanent construction.
 - 2. At completion of work.
- B. Clean and restore areas damaged by installation by use of temporary facilities.
 - 1. Remove foundations and underground installations for construction aids.
 - 2. Grade and grass areas of site affected by temporary installations to required elevations, slopes, ground cover and clean the area.
- C. Restore permanent facilities used for temporary purposes to specified condition or in kind if not specified.

END OF SECTION

SECTION 01568

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall design, provide, maintain and remove temporary erosion and sedimentation controls as necessary to ensure compliance to limits established by City, Federal, State or Local agencies having jurisdiction over the work. Contractor is responsible for erosion and sedimentation control during construction or until final controls become effective.
- B. Temporary controls will be implemented to prevent soil erosion from the site surface. This includes erosion caused by rainfall or storm runoff. These control measures include, but are not limited to:
 - 1. Mulching, seeding, chemical binders, rip-rap or tack coats on site surfaces.
 - 2. Providing drainage and runoff controls at those locations which will prevent or maintain within acceptable limits, scour or gully erosion.
 - 3. Scheduling work in areas of the site that will be susceptible to erosion so that they are not left unprotected during times of heavy rainfall.
- C. Temporary sedimentation controls will be implemented to limit soil transport and prevent sediment pollution outside the limits of work. These controls include, but are not limited to; terracing, contouring, dams, screens, traps, basins, barriers, or other appurtenances located on, or at the foot of, sloped surfaces or within water ways.

PART 2 - PRODUCTS

2.01 EROSION CONTROL

- A. Solid sodding shall meet requirements as specified in Section 02822.
- B. Covering fabric shall be fabricated of material acceptable to Engineer.
- C. Silt Screens shall be fabricated of material which conforms to FDOT Index 102.

2.02 SEDIMENTATION CONTROL

- A. Bales shall be clean, seed free, cereal hay type.
- B. Netting shall be fabricated of material acceptable to ENGINEER.

- C. Filter stone shall be crushed stone conforming to Florida Department of Transportation Specifications.
- D. Concrete block shall be hollow, non-load bearing type.
- E. Concrete shall be exterior grade not less than one inch thick.
- F. Silt Screens shall be fabricated of material acceptable to ENGINEER.

PART 3 - EXECUTION

3.01 EROSION CONTROL

- A. Minimum procedures for seeding are:
 - 1. Scarify slopes to a depth of not less than six inches and remove large clods, rocks, stumps, roots larger than ½ inch in diameter and debris.
 - 2. Sow seed by hydro or mechanical methods within twenty-four (24) hours after ground is scarified.
 - 3. Apply mulch loosely and to a thickness of between ¾ inch and 1½ inches.
 - 4. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

3.02 SEDIMENT CONTROL

- A. Install and maintain effective sediment controls. Straw or hay bale dikes, sediment traps or basins shall be constructed in accordance with the Florida Department of Transportation drainage manual.

3.03 PERFORMANCE

- A. Should any of the temporary erosion or sediment control measures employed by Contractor fail to produce results which comply with the requirements of the State of Florida, Owner, Engineer, City or other regulatory agencies with jurisdiction, Contractor shall immediately take whatever steps are necessary to correct the deficiency at no cost to the Owner.

3.04 REMOVAL

- A. When final permanent controls become effective or when directed by Engineer, Contractor shall remove temporary erosion and sedimentation controls and restore surfaces to preconstruction conditions or as required by the Contract Documents.

END OF SECTION

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SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Contractor is responsible for furnishing and installing the material and equipment as required by the Contract Documents. Proper approval of submittals and substitutions are required. Furnished material and equipment shall be properly transported, handled, stored and protected in accordance with manufacturer's instructions; federal, state or local regulations, or as approved by Engineer.
 - 1. Material and equipment incorporated into the Work:
 - a. Shall not be defective.
 - b. Shall comply with size, make, type, and quality as specified in the Contract Documents, or as specifically approved in writing by Engineer.
 - c. Shall not be used for any purpose other than that for which it is designed or is specified.
 - 2. Manufactured and fabricated products:
 - a. Design, fabricate, and assemble in accordance 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, supplied 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 specifically approved in writing.

1.02 APPROVAL OF MATERIALS

- A. Only new materials and equipment shall be incorporated in the Work unless otherwise specified in the Contract Documents or approved by Engineer. All materials and equipment furnished by Contractor shall be subject to the inspection and approval of Engineer. No material shall be delivered to the Work without prior written approval of Engineer.

- B. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by Contractor. If required by the Contract Documents or as requested by ENGINEER, either prior to beginning or during the progress of the Work, Contractor shall submit samples of materials for such special tests as may be necessary to demonstrate that they conform to the approved specifications. Such samples shall be furnished, in accordance with the General Conditions. Except as otherwise noted, Engineer will make arrangements for and pay for the tests.
- C. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes and surfaces, Contractor shall provide such samples of workmanship or finish as may be required.
- D. The materials and equipment used on the Work shall correspond to the approved samples or other data.

1.03 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 upon 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.

1.04 STORAGE AND PROTECTION

- A. All materials and equipment to be incorporated in the Work shall be handled and stored by 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.
- B. Cementitious and other products sensitive to moisture damage shall be stored under a roof, off the ground and shall be kept completely dry at all times. All structural and miscellaneous steel, and reinforcing steel shall be stored off the ground to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting.
- C. All materials which, in the opinion of ENGINEER, have become so damaged as to be unfit for the use intended shall be promptly removed from the site of the Work, and Contractor shall receive no compensation for the damaged material, its removal or its replacement.

- D. 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.
- E. Contractor shall be responsible for all material, equipment and supplies sold and delivered to the Owner under this Contract until final inspection of the Work and acceptance by the Engineer. In the event any such material, equipment and supplies are lost, stolen, or become defective prior to final inspection and acceptance, Contractor shall replace same without additional cost to the Owner.
- F. Should Contractor fail to take proper action on storage and handling of equipment supplied under this Contract within ten days after written notice to do so has been given, Owner retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from Contractor's next progress payment. These costs may be comprised of expenditures for labor equipment usage, administrative, clerical, engineering and any other costs associated with making the necessary corrections.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01650

START-UP AND DEMONSTRATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Demonstrate to Owner and Engineer that the Work functions as a complete and operable system under normal and emergency operating conditions.
- B. Contractor shall provide all materials, personnel, equipment and expendables as needed and as specified to perform the required start-up and demonstration tests.
- C. Related Work Described Elsewhere:
 - 1. Progress Schedules: Section 01310.
 - 2. Operating and Maintenance Data: Section 01730.
 - 3. Equipment: Division 11.
 - 4. Mechanical: Division 15.

PART 2 - PRODUCTS

2.01 START-UP PLAN

- A. Submit for approval by the Engineer a detailed start-up plan outlining the schedule and sequence of all tests and start-up activities, including submittal of checkout forms, submittal of demonstration test procedures, start-up, demonstration and testing, submittal of certification of completed demonstration and training. Start-up and commissioning may not begin until the plan is approved by the Engineer.

PART 3 - EXECUTION

3.01 COMPONENT TEST AND CHECK-OUT

- A. Start-up Certification: Prior to system start-up, successfully complete all the testing required of the individual components of the Work. Submit six (6) copies of check out forms for each individual component or piece of equipment, signed by the Contractor or the subcontractor and the manufacturer's representative. All copies of the Operation and Maintenance Manuals must be provided before start-up may begin. These forms shall be completed and submitted before Instruction in Operation to Owner or a request

for initiating any final inspections. Insert one (1) copy of this form into the applicable section of each Operation and Maintenance Manual.

- B. Demonstrate to the Engineer and the Owner's representative, that all temporary jumpers and/or bypasses have been removed and that all of the components are operating under their own controls as designated.
- C. Coordinate start-up activities with the Owner's operating personnel at the treatment plant site and with the Engineer prior to commencing system start-up.

3.02 START-UP

- A. Initiate start-up and training in accordance with and with the use of the plant operation and maintenance manuals.
- B. Observe the component operation and make adjustments as necessary to optimize the performance of the Work.
- C. Coordinate with Owner for any adjustments desired or operational problems requiring debugging.
- D. Make adjustments as necessary.

CHECK OUT FORM

☐	OWNER	<u>City of Sanford</u>	No. Copies	_____	CHECK-OUT MEMO NO. _____
☐	ENGINEER:	<u>Tetra Tech</u>	No. Copies	_____	
☐	ARCHITECT:	_____	No. Copies	_____	
☐	CONTRACTOR:	_____	No. Copies	_____	
☐	FIELD:	_____	No. Copies	_____	
☐	OTHER:	_____	No. Copies	_____	

PROJECT DATA

NAME: _____
LOCATION: _____
OWNER: _____
OTHER: _____

CONTRACT DATA

NUMBER: _____
DATE: _____
DRAWING NO: _____
SPECIFICATION
SECTION: _____

Name of equipment checked: _____

Name of manufacturer of equipment: _____

1. The equipment furnished by us has been checked on the job by us. We have reviewed, where applicable, the performance verification information submitted to us by the Contractor.
2. The equipment is properly installed, except for items noted below.*
3. The equipment is operating satisfactorily, except for items noted below.*
4. The written operating and maintenance information, where applicable, has been presented to the Contractor, and been discussed with him in detail. Five (5) copies of all applicable operating and maintenance information and parts lists have been furnished to him.

Checked By: _____

Name of Manufacturer's Rep.

Name of General Contractor

Address and Phone # of Rep.

Authorized Sig./Title/Date

Sig./Title/Pers. Making Chk.

Name of Subcontractor

Date Checked

Authorized Sig./Title/Date

Manufacturer's Representative Notations: Exceptions noted at time of check were:

Manufacturer's Representative to note adequacy of related equipment that directly affects operation, performance or function of equipment checked. (No comment presented herein will indicate adequacy of related systems or equipment):

CERTIFICATE OF COMPLETED DEMONSTRATION FORM

☐	OWNER	<u>City of Sanford</u>	No. Copies	_____	CERTIFICATE
☐	ENGINEER:	<u>Tetra Tech</u>	No. Copies	_____	OF COMPLETED
☐	ARCHITECT:	_____	No. Copies	_____	DEMONSTRATION
☐	CONTRACTOR:	_____	No. Copies	_____	MEMO NO. _____
☐	FIELD:	_____	No. Copies	_____	
☐	OTHER:	_____	No. Copies	_____	

PROJECT DATA

NAME: _____
LOCATION: _____
OWNER: _____
OTHER: _____

CONTRACT DATA

NUMBER: _____
DATE: _____
DRAWING NO: _____
SPECIFICATION
SECTION: _____

NOTE TO CONTRACTOR:

Submit five (5) copies of all information listed below for checking at least one (1) week before scheduled demonstration of the Work. After all information has been approved by the Engineer, give the Owner a Demonstration of Completed Systems as specified and have the Owner sign five (5) copies of this form. After this has been done, a written request for a final inspection of the system shall be made.

MEMORANDUM:

This memo is for the information of all concerned that the Owner has been given a Demonstration of Completed Systems on the work covered under this Specification Section. This conference consisted of the system operation, a tour on which all major items of equipment were explained and demonstrated, and the following items were given to the Owner:

- (a) Owner's copy of Operation and Maintenance Manual for equipment or systems specified under this Section containing approved submittal sheets on all items, including the following:
 - (1) Maintenance information published by manufacturer on equipment items.
 - (2) Printed warranties by manufacturers of equipment items.
 - (3) Performance verification information as recorded by the Contractor.
 - (4) Check-Out Memo on equipment by manufacturer's representative.
 - (5) Written operating instructions on any specialized items.
 - (6) Explanation of guarantees and warranties on the system.
- (b) Prints showing actual "As-Built" conditions.
- (c) A demonstration of the system in operation and of the maintenance procedures which will be required.

(Name of General Contractor)

By: _____
(Authorized Signature, Title and Date)

(Name of Subcontractor)

By: _____
(Authorized Signature, Title and Date)

Operation and Maintenance Manuals, Instruction Prints, Demonstration and Instruction in Operation
Received:

(Name of Owner)

By: _____
(Authorized Signature/Title/Date)

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Comply with requirement stated in Conditions of the Contract and in specifications for administrative procedures in closing out the Work.
- B. Related Requirements Described Elsewhere:
 - 1. Start-Up: Section 01650.
 - 2. Project Housekeeping: Section 01710.
 - 3. Project Record Documents: Section 01720.
 - 4. Operating and Maintenance Data: Section 01730.
 - 5. Warranties and Bonds: Section 01740.

1.02 SUBSTANTIAL COMPLETION

- A. The Work will not be substantially complete, and Contractor may not request substantial completion inspection unless the following submittals and work is completed:
 - 1. All Operation and Maintenance manuals have been submitted and approved to the requirements of Section 01730.
 - 2. All start-up and demonstration testing completed and Certificates of Completed Demonstration submitted to the requirements of Section 01650.
 - 3. Project Record Documents have been submitted and reviewed to the requirements of Section 01720.
 - 4. All training of Owner's personnel completed.
 - 5. All areas to be used and occupied are safe, operable in automatic and complete.
 - 6. All portions and areas of the Work have been properly disinfected and cleared.
 - 7. All deficiencies noted on inspection reports or nonconformances are corrected or the correction plan approved.

- B. When the conditions of paragraph 1.02 A. are met the Contractor shall submit to the Engineer:
 - 1. A written notice that he considers the Work, or portion thereof, is substantially complete, and request an inspection.
 - 2. A punchlist of items to be corrected. (Uncompleted work which is not related to the safe, effective, efficient use of the Project may be allowed on the punchlist with the Engineer's approval.)
- C. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to determine the status of completion.
- D. Should the Engineer determine that the Work is not substantially complete:
 - 1. The Engineer will promptly notify the Contractor in writing, giving the reasons therefor.
 - 2. Contractor shall remedy the deficiencies in the Work and send another written notice of substantial completion to the Engineer.
 - 3. The Engineer will within reasonable time, reinspect the Work. The Contractor will be liable for reinspection fees as described in paragraph 1.04, herein.
- E. When the Engineer finds that the Work is substantially complete, he will:
 - 1. Schedule a walk-through of the facility to include the Owner, Engineer to determine the completeness of the punchlist and readiness of the facility for occupancy.
 - 2. Prepare and deliver to Owner a tentative Certificate of Substantial Completion with the tentative punchlist of items to be completed or corrected before final inspection.
 - 3. After consideration of any objections made by the Owner as provided in Conditions of the Contract, and when the Engineer considers the Work substantially complete, he will execute and deliver to the Owner and the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected. Any incomplete work allowed on a punchlist must be reinspected upon completion and any deficiencies found will be added to the punchlist.

1.03 FINAL INSPECTION

- A. Prior to Contractors request for a final inspection the following submittals and work must be complete:
 - 1. Project Record Documents must be approved.

2. All spare parts must be suitably delivered to the requirements of Section 01730.
 3. Contractor to submit evidence of compliance with requirements of governing authorities.
- B. After satisfying the requirements of paragraph 1.03 A. and when Contractor considers the Work complete, he shall submit written certification that:
1. Contract Documents have been reviewed.
 2. Work has been inspected for compliance with Contract Documents.
 3. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
 4. All punchlist items have been corrected.
- C. The Engineer will, within reasonable time, make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- D. 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 another written certification to the Engineer that the Work is complete.
 3. The Engineer will within a reasonable amount of time, reinspect the Work and the Contractor shall be liable for reinspection fees as described in paragraph 1.04.
- D. When the Engineer finds that the Work is acceptable under the Contract Documents, the Contractor may make closeout submittals.

1.04 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. Contractor will compensate the Owner for such additional services.
 2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS

- A. Warranties and Bonds: To requirements of Section 01740.

- B. Evidence of Payment and Release of Liens.
- C. Certificate of Insurance for Products and Completed Operations.

1.06 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 or written amendment.
 - b. Deductions for uncorrected work.
 - c. Deductions for liquidated damages.
 - d. Deductions for reinspection payments.
 - e. 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.

1.07 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01710

PROJECT HOUSEKEEPING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Maintain construction cleanliness during progress of the Work and perform final cleaning at completion of the Work, and as required by conditions of the Contract. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces. Cleaning materials used for cleaning surfaces that will come into contact with potable water shall be NSF approved.
- B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute daily cleaning to keep the Work, the site, access ways, streets and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.
- B. Provide on-site containers for the collection of waste materials, debris and rubbish containers must be emptied daily or as frequently as necessary to contain disposals
- C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.
- D. Schedule operations so that dust and other contaminants resulting from cleaning process shall not fall on wet or newly coated surfaces.

3.02 FINAL CLEANING

- A. Employ skilled workmen for final cleaning.
- B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.
- C. Prior to final completion, or the Owner's occupancy, Contractor shall conduct an inspection of all work areas, to verify that the entire Work is clean.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall maintain at the site for the Owner one record copy of:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change orders and other modifications to the Contract.
5. Engineer field orders or written instructions.
6. Approved shop drawings, product data and samples.
7. Field test records.
8. As Built Drawings.

B. Related Requirements:

1. General Conditions
2. Section 01200: Project Meetings
3. Section 01340: Shop Drawings and Submittals

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. The Contractor shall store record documents, As-Built, and samples apart from documents used for construction.

1. Provide files and racks for storage of documents.
2. Provide locked cabinet or secure storage space for storage of samples.

B. Documents shall be maintained in a clean, dry, legible condition and in good order. Do not use As-Built Documents for construction purposes.

C. Documents and samples shall be available at all times for inspection by the Engineer.

1.03 MARKING DEVICES

- A. The Contractor shall provide suitable permanent marking pens for recording information in the color code designated by the Engineer.

1.04 RECORDING

- A. Each document shall be labeled "AS BUILT" in large printed letters, and shall include the Contractor's name and the name of the person responsible for the As Built Drawings.
- B. As-Built information shall be kept current with construction progress.

1.05 SUBMITTAL

- A. Sketches showing the As-Built information shall be made available to the Engineer for review monthly with the Application For Progress Payment. As Built Drawings shall be reviewed with the Engineer monthly as part of the Application for Progress Payment review process.
- B. At Contract close-out, deliver a complete set of As Built Documents to the Engineer for the Owner.
- C. Accompany submittal with transmittal letter in duplicate, containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's name and address.
 - 4. Title and number of each As Built Document.
 - 5. Certification that each document as submitted is complete and accurate.
 - 6. Signature of the Contractor or his authorized representative.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01730

OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.
 - a. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.
2. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

1.02 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:

1. Trained and experienced in maintenance and operation of described products.
2. Familiar with requirements of this Section.
3. Skilled as technical writer to the extent required to communicate essential data.
4. Skilled as draftsman competent to prepare required drawings.

1.03 FORM OF SUBMITTALS

A. Prepare data in form of an instructional manual for use by Owner's personnel.

B. Format:

1. Size: 8-1/2 inches x 11 inches.
2. Paper: 20 pound minimum, white, for typed pages.
3. Text: Manufacturer's printed data, or neatly typewritten.
4. Drawings:
 - a. Provide reinforced punched binder tab, bind in with text.

- b. Reduce larger drawings and fold to size of text pages but not larger than 14 inches x 17 inches.
- 5. Provide fly-leaf for each separate product, or each piece of operating equipment.
 - a. Provide typed description of projects and major component parts of equipment.
 - b. Provide identified tabs.
- 6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
 - a. Title of Project.
 - b. Identity of separate structure as applicable.
 - c. Identity of general subject matter covered in the manual.

C. Binders:

- 1. Commercial quality , three D-ring type binders with durable and cleanable white plastic covers. Binders shall be presentation type with clear vinyl covers on front, back and spine. Binders shall include two sheet lifters and two, horizontal inside pockets.
- 2. Maximum D-ring width: 2 inches.
- 3. When multiple binders are used, correlate the data into related consistent groupings.

1.04 CONTENT OF MANUAL

- A. Neatly typewritten table of contents for each volume, arranged in systematic order.
 - 1. Contractor, name of responsible principal, address and telephone number.
 - 2. A list of each product required to be included, indexed to content of the volume.
 - 3. List, with each product, name, address and telephone number of:
 - a. Subcontractor, manufacturer and installer name, addresses and telephone numbers.
 - b. A list of each product required to be included, indexed to content of the volume.

- c. Identify area of responsibility of each.
 - d. Local source of supply for parts and replacement equipment including name, address and telephone number.
 - 4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
- B. Product Data:
 - 1. Include only those sheets which are pertinent to the specific product.
 - 2. Annotate each sheet to:
 - a. Clearly identify specific product or part installed.
 - b. Clearly identify data applicable to installation.
 - c. Delete references to inapplicable information.
 - 3. Operation and maintenance information as herein specified.
 - 4. Record shop drawings as submitted and approved with all corrections made for each product.
- C. Drawings:
 - 1. Supplement product data with drawings as necessary to clearly illustrate:
 - a. Relations of component parts of equipment and systems.
 - b. Control and flow diagrams.
 - 2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
 - 3. Do not use Project Record Documents as maintenance drawings.
- D. Written test, as required to supplement product data for the particular installation:
 - 1. Organize in consistent format under separate headings for different procedures.
 - 2. Provide logical sequence of instruction of each procedure.
- E. Copy of each warranty, bond and service contract issued.
 - 1. Provide information sheet for Owner's personnel, give:

- a. Proper procedures in event of failure.
- b. Instances which might affect validity of warranties or bonds.

1.05 MANUAL FOR MATERIALS AND FINISHES

- A. Submit six (6) copies of complete manual in final form.
- B. Content: for architectural products, applied materials and finishes:
 - 1. Manufacturer's data, giving full information on products.
 - a. Catalog number, size, composition.
 - b. Color and texture designations.
 - c. Information required for reordering special manufacturing products.
 - 2. Instructions for care and maintenance.
 - a. Manufacturer's recommendation for types of cleaning agents and methods.
 - b. Cautions against cleaning agents and methods which are detrimental to product.
 - c. Recommended schedule for cleaning and maintenance.
- C. Content, for moisture protection and weather-exposed products:
 - 1. Manufacturer's data, giving full information on products.
 - a. Applicable standards.
 - b. Chemical composition.
 - c. Details of installation.
 - 2. Instructions for inspection, maintenance and repair.
- D. Additional requirements for maintenance data: Respective sections of Specifications.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit six (6) copies of complete manual in final form.
- B. Content, for each unit of equipment and system, as appropriate:
 - 1. Description of unit and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 - d. Summary of information listed on equipment and motor data plates.
 - 2. Operating procedures:
 - a. Start-up, break-in, routine and normal operating instructions.
 - b. Regulation, control, stopping, shut-down and emergency instructions.
 - c. Summer and winter operating instructions.
 - d. Special operating instructions.
 - 3. Maintenance procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Alignment, adjusting and checking.
 - 4. Servicing and lubrication required.
 - 5. Manufacturer's printed operating and maintenance instructions.
 - 6. Description of sequence of operation by control manufacturer.
 - 7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
 - a. Predicted life of parts subject to wear.
 - b. Items recommended to be stocked as spare parts.

8. As-installed control diagrams by controls manufacturer.
 9. Each Contractor's coordination drawings.
 - a. As-installed color coded piping diagrams.
 10. Charts of valve tag numbers, with location and function of each valve.
 11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.
 12. Other data as required under pertinent sections of specifications.
 13. Approved record shop drawings with all corrections made, and a copy of the warranty statement, checkout memo, demonstration test procedures and demonstration test certification.
- C. Content, for each electric and electronic systems, as appropriate:
1. Description of system and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 2. Circuit directories and panelboards.
 - a. Electrical service.
 - b. Controls.
 - c. Communications.
 3. As installed color coded wiring diagrams.
 4. Operating procedures:
 - a. Routine and normal operating instructions.
 - b. Sequences required.
 - c. Special operating instructions.
 5. Maintenance procedures:
 - a. Routine operations.

- b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Adjustment and checking.
- 6. Manufacturer's printed operating and maintenance instructions.
- 7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
- 8. Other data as required under pertinent sections of specifications.
- D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
- E. Additional requirements for operating and maintenance data: Respective sections of Specifications.

1.07 SUBMITTAL SCHEDULE

- A. Submit two (2) copies of preliminary draft of proposed formats and outlines of contents of Operation and Maintenance Manuals within 90 days after Notice to Proceed.
- B. Submit two (2) copies of completed data in preliminary form no later than 20 days following Engineer's review of the last shop drawing of a product and/or other submittal, but no later than delivery of equipment. One (1) copy will be returned with comments to be incorporated into the final copies and the other copy will be retained on-site for use in any early training.
- C. Submit six (6) copies of approved manual in final form directly to the offices of the Engineer, Tetra Tech, within 10 days after the reviewed copy or last item of the reviewed copy is returned.
- D. Provide six (6) copies of addenda to the operation and maintenance manuals as applicable and certificates as specified within 30 days after final inspection.

1.08 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to demonstration test, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction. Review contents of manual with Owner's operating and maintenance personnel in full detail to explain all aspects of operations and maintenance.

- C. Instructors shall be fully qualified personnel as outlined within the individual equipment specifications. If no specific training specifications are listed with the equipment, the Contractor shall provide the instruction with qualified Contractor personnel.
- D. The Contractor shall provide a list to the Owner indicating the date, time and instructors that will be present for all training sessions.
- E. The instructors shall provide for and prepare lesson scopes and handouts for up to five individuals designated by the Owner that outline the items to be covered. Separate sessions for operation and maintenance instruction shall be provided consecutively. Handouts shall be submitted to the Owner with at least one week's notice prior to the training sessions.
- F. All instruction sessions shall be video recorded with portable video recording cameras supplied by the Contractor. Video recording shall be made by the Contractor under the direction of the Owner using DHS compatible video recording equipment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work:
 - 1. Compile specified warranties and bonds.
- B. Related Work Described Elsewhere:
 - 1. General Conditions: Division 1.
 - 2. Contract Closeout: Section 01700.

1.02 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Number of original signed copies required: Two (2) each.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product of work item.
 - 2. Firm, with name of principal, address and telephone number.
 - 3. Scope.
 - 4. Date of beginning of warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond or service maintenance contract.
 - 6. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity or warranty or bond.
 - 7. Contractor, name of responsible principal, address and telephone number.

1.03 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8-1/2 inches by 11 inches, punch sheets for standard three (3) ring binder.
 - a. Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
 - a. Title of Project.
 - b. Name of Contractor.
- C. Binders: Commercial quality, three (3) D-ring type binders with durable and cleanable white plastic covers and maximum D-ring width of two (2) inches. Binders shall be presentation type with clear vinyl covers on front, back, and spine. Binders shall include two sheet lifters and two horizontal inside pockets.

1.04 WARRANTY SUBMITTALS REQUIREMENTS

- A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the Contractor's for one (1) year, unless otherwise specified, commencing at the time of final acceptance by the Owner.
- B. The Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment specified under Divisions 11: Equipment; 13: Special Construction; 15: Mechanical; and 16: Electrical and which has at least a 1 hp motor or which lists for more than \$1,000. The Engineer reserves the right to request warranties for equipment not classified as major. The Contractor shall still warrant equipment not considered to be "major" in the Contractor's one-year warranty period even though certificates of warranty may not be required.
- C. In the event that the equipment manufacturer or supplier is unwilling to provide a one (1) year warranty commencing at the start of the Correction Period, the Contractor shall obtain from the manufacturer a two (2) year warranty commencing at the time of equipment delivery to the job site. This two (2) year warranty from the manufacturer shall not relieve the Contractor of the one (1) year warranty, starting at the time of Owner's acceptance of the equipment.
- D. The Owner shall incur no labor or equipment cost during the guarantee period.
- E. Guarantee shall cover all necessary labor, equipment, materials, and replacement parts resulting from faulty or inadequate equipment design, improper assembly or erection,

defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by the manufacturer or the Contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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DIVISION 2

SITEWORK

SECTION 02140

DEWATERING (DURING CONSTRUCTION)

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The work to be performed under this Section shall include the design and installation of a dewatering system until completion of construction to dewater subsurface waters from structures or pipe trenches as may be required.
- B. Related Work Described Elsewhere:
 - 1. Shop Drawings and Submittals: Section 01340.
 - 2. Earthwork: Section 02200.
- C. The Contractor, if required, shall obtain necessary permits from the Water Management District for dewatering.

1.02 QUALITY ASSURANCE

- A. Qualifications: The temporary dewatering system shall be designed by a firm who regularly engages in the design of dewatering systems and who is fully experienced, reputable and qualified in the design of such dewatering systems. The firm shall have a successful record of operation for a minimum of five (5) years prior to bid date.
- B. In lieu of experience, the dewatering firm shall provide a performance and warranty bond for 1.5 times the total installed cost of the temporary dewatering system. This bond shall be executed prior to award and/or contract execution.
- C. Standards: The dewatering of any excavation areas and the disposal of water during construction shall be in strict accordance with all local and State government rules and regulations.

1.03 SUBMITTALS

- A. Materials and Shop Drawings: Shop drawings required to establish compliance with the Specifications shall be submitted in accordance with the provisions of Section 01340: Shop Drawings and Submittals. Submittals shall include at minimum the following:
 - 1. Design notes and drawings.
 - 2. Descriptive literature of the temporary dewatering system.

3. Layout of all piping involved.
4. Bill of materials.
5. Water Management District permit, if required.

1.04 CRITERIA

- A. The dewatering system shall be developed to the point that is capable of dewatering such that groundwater levels are maintained at least one (1) foot below the bottom of excavations. Prior to installation of the dewatering system, the Owner must be provided with the proposed plan and approve the proposed system prior to installation. The system shall be capable of dewatering and maintaining groundwater levels at the respective structures or trenches. Observation wells may be required for the purpose of testing the system.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The equipment specified herein shall be standard dewatering equipment of proven ability as designed and manufactured by firms having experience in the design and production of such equipment. The equipment furnished shall be designed, constructed and installed in accordance with the best practices and methods.
- B. The Contractor shall be required to monitor the performance of the dewatering system during the progress of the work and require such modifications as may be required to assure that the systems will perform satisfactorily. Dewatering systems shall be designed in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils and to preserve the integrity of adjacent structures.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Dewatering: The Contractor shall install the dewatering system for the removal of subsurface water encountered during construction of the proposed structures.

3.02 PROTECTION AND SITE CLEAN-UP

- A. At all times during the progress of the Work the Contractor shall use all reasonable precautions to prevent either tampering with the system, or the entrance of foreign material.
- B. After the system is no longer needed, the Contractor shall remove all of his equipment, materials, and supplies from the site of the work, remove all surplus materials and

debris, fill in all holes or excavations, and grade the site to elevations of the surface levels which existed before work started. The site shall be thoroughly cleaned and approved by the Engineer.

END OF SECTION

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SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The work included under this Section consists of dewatering, excavating, trenching, sheeting/shoring, filling, grading, backfilling, and compacting those soil materials required for the construction of the embankments, structures, piping, ditches, utility structures and appurtenances as shown on the Drawings and specified herein.
- B. Definitions
 - 1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material as determined by ASTM D1557.
 - 2. Optimum Moisture Content: The optimum moisture content shall be determined by ASTM D 1557 to determine the maximum dry density for relative compaction. Field moisture content shall be determined on the basis of the fraction passing the 3/4-inch sieve.
 - 3. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.
 - 4. Suitable: Suitable material shall be non-cohesive, non-plastic granular local sand that is free from vegetation, organic material, marl, silt or muck. The materials shall also meet detailed requirements specified herein. The Contractor shall furnish all additional fill material required.
 - 5. Unsuitable: Unsuitable materials are highly organic soil (peat or muck) classified as A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, and A-8 in accordance with AASHTO Designation M 145.
- C. Plan For Earthwork
 - 1. The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work.

2. Prior to commencing the excavation, the Contractor shall submit a plan of his proposed operations to the Engineer for review. The Contractor shall reflect the equipment and methods to be employed in the excavation. Prices established in the Proposal for the work to be done will reflect all costs pertaining to the work. No claims for extras based on substrata or groundwater table conditions will be allowed.
- D. Trench Safety Act: The Contractor shall comply with all of the requirements of the Florida Trench Safety Act (Chapter 90-96, CS/CB 2626, Laws of Florida). The Contractor shall acknowledge that included in various items of his bid proposal and in the total bid price are costs for complying with the provisions of the Act.
- E. Related Work Described Elsewhere
 1. Shop Drawings, Working Drawings, and Samples: Section 01340.
 2. Testing and Testing Laboratory Services: Section 01410.
 3. Temporary Erosion and Sedimentation Control: Section 01568.
 4. Dewatering: Section 02140.
 5. Process and Utility Piping, Fittings, Valves, and Accessories: Section 15050.

1.02 APPLICABLE PUBLICATIONS

- A. All publications and standard specifications referred to herein are the latest or current issue of that publication or specification as of the specification date.

1.03 QUALITY ASSURANCE

- A. The requirements for testing and laboratory services are specified in Section 01410: Testing and Testing Laboratory Services.

1.04 FEDERAL AND STATE REGULATORY REQUIREMENTS

- A. All trench excavations which exceed 5 feet in depth shall comply with the applicable trench safety standards as stated in the OSHA excavation safety standards 29 CFR S. 1926.650 Subpart P as regulated and administered by the Florida Department of Labor and Employment Security as the "Florida Trench Safety Act."

1.05 JOB CONDITIONS

- A. If, in the opinion of the Engineer, conditions encountered during construction warrant a change in the footing elevation, or in the depth of removal of unsuitable material from that indicated in the soils report, an adjustment will be made in the contract price.

1.06 SUBMITTALS

- A. Submit to the Engineer for review the proposed methods of construction, including dewatering, excavation, bedding, filling, compaction and backfilling for the various portions of the work. Review shall be for information only. The Contractor shall remain responsible for the adequacy and safety of the methods. Where sheeting and bracing is required for construction, the design shall be performed by a Professional Geotechnical Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General

- 1. All fill material from on and off-site sources shall be subject to the approval of the Engineer.
- 2. All fill material shall be unfrozen and free of organic material, trash, or other objectionable material. Excess or unsuitable material shall be removed from the job site by the Contractor.

B. Common Fill Material

- 1. Common Fill shall be sand not containing stones, rock, concrete or other rubble larger than 2 inches in diameter. No more than 10% of the material, by weight, shall pass a 200-mesh sieve and organic matter in the material shall be less than 1% by weight.
- 2. The Contractor shall utilize as much excavated material as possible for reuse in accordance with the Drawings and Specifications or as directed by the Engineer.
- 3. The Engineer shall direct the Contractor on the type of material allowed in certain sections of the earthwork operations.

C. Select Common Fill

- 1. Select Common Fill material shall be free from stones larger than 1 1/2 inches and no more than 5% of the material shall pass a 200-mesh sieve. The amount of organic matter in the material shall not exceed 1% by weight.
- 2. The Contractor shall utilize as much excavated material as possible for reuse in accordance with the Drawings and Specifications or as directed by the Engineer.
- 3. The Engineer shall direct the Contractor on the type of material allowed in certain sections of the earthwork operations.

- D. Structural Fill: Structural fill shall be well graded sand to gravelly sand having the following gradation:

<u>U.S. Sieve Size</u>	<u>Percent Passing By Weight</u>
1-inch	100
No. 4	75 - 100
No. 40	15 - 80
No. 100	0 - 30
No. 200	0 - 10

- E. Bedding Rock: Manufactured angular, granular material, 1/4 to 1-1/2 inches (6 to 40 mm) in size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

1. Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C33 stone size No. 89 and with particle size limits as follows:

<u>U.S. Sieve Size</u>	<u>Percent Passing By Weight</u>
1/2	100
3/8	90 - 100
No. 4	20 - 55
No. 8	5 - 30
No. 16	0 - 10
No. 50	0 - 5

- F. Other Material: All other material, not specifically described, but required for proper completion of the work shall be selected by the Contractor and approved by the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clearing and grubbing shall be completed prior to excavation.
- B. Protection
1. Sheeting and Bracing:
- a. Furnish, put in place, and maintain sheeting and bracing as required to support the sides of excavations, to prevent movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, and to protect

workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other approved methods. If the Owner is of the opinion that sufficient or proper supports have not been provided, he may order additional supports be installed at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids beside the sheeting, but if voids are formed, they shall be immediately filled and compacted. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the Owner.

- b. The Contractor shall construct sheeting outside the neat lines of the foundation unless another configuration is desirable for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall withstand all pressure to which the structure or trench will be subjected. Any deformation shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.
- c. Where sheeting and bracing is required for construction, the Contractor shall engage a Professional Geotechnical Engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed shall conform to the design, and certification of this shall be provided by the Professional Geotechnical Engineer.
- d. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.
- e. The Contractor shall leave in place to be embedded in the backfill, all sheeting and bracing not shown on the Drawings but which the Owner directs him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The Owner may direct that timber used for sheeting and bracing be cut off at any specified elevation.
- f. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction, or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted for that purpose, or otherwise directed by the Owner.
- g. The right of the Owner to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring

from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

- h. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than one (1) foot above the top of any pipe.

2. Pumping and Drainage

- a. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels as stipulated in Section 02140. The Contractor shall submit to the Engineer for review a plan for dewatering systems prior to commencing work. The installed dewatering system shall be in conformity with the overall construction plan. The Contractor shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be required to assure that the systems are performing satisfactorily.
- b. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at the bottom of the excavation and to preserve the integrity of adjacent structures. Well or sump installations shall be constructed with proper sand filters to prevent intermixing of finer grained soil from the surrounding ground.
- c. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.
- d. The Contractor shall take all additional precautions to prevent buoyant uplift of any structure during construction.
- e. The conveying of dewatered liquids in open ditches or trenches will not be allowed. Permission to use any storm sewers, or drains, for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. The Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found.

Any damage to facilities shall be repaired or restored as directed by the Owner or the authority having jurisdiction, at no cost to the Owner.

- f. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
- g. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system, shall be removed by the Contractor.
- h. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

3.02 EXCAVATION

A. General

- 1. Excavation consists of removal, storage and disposal, if necessary, of material encountered when establishing required grade elevations and in accordance with the notes shown in the Drawings.
- 2. Unsuitable materials shall be removed under all proposed structures, pipes, and roads. Also, the unsuitable materials described above shall be removed outside of the structures, pipes, and roads by a margin equal to the depth of material, or 5 feet, whichever is greater. Replacement material shall be Common Fill placed and compacted as specified herein.
- 3. Authorized earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation.
- 4. Unauthorized excavation consists of removal of material beyond the limits needed to establish required grade and subgrade elevations without specific direction of the Engineer. Unauthorized excavation, as well as remedial work shall be at the Contractor's expense. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise specified or directed by the Engineer.
- 5. When excavation has reached required subgrade elevations, make an inspection of conditions. If the material is unsuitable or has clay and/or organic material, and if authorized by Engineer to remove, carry excavation deeper and replace excavated material with Bedding Rock. Removal and replacement of unsuitable

subgrade material, as directed by the Engineer, will be paid for as extra work by unit prices established in the Bid Form.

6. If the Contractor excavates below grade through error or for his own convenience or through failure to properly dewater the excavation or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the Engineer to excavate below grade as set forth in the preceding paragraph, in which case the work of excavating below grade and finishing and placing the refill shall be performed at his own expense.
7. Stockpile satisfactory excavated materials at a location approved by the Engineer until required for backfill or fill. Stockpiles shall be placed and graded for proper drainage. All soil materials shall be located away from the edge of excavations. Excess soil materials shall be disposed of by the Contractor.

B. Trench Excavation

1. Excavation for all trenches required for the installation of pipes shall be made to the depths indicated on the Drawings and in such a manner and to such widths as will give suitable room for laying the pipe within the trenches, for bracing and supporting and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry.
2. Excavation shall not exceed normal trench width. Normal trench width is defined as indicated on the Drawings. Any excavation which exceeds the normal trench width, shall require special backfill requirements as determined by the Engineer.
3. Rock shall be removed to provide at least eight inches clearance around the bottom and sides of the pipe being laid.
4. Where pipe is to be laid in Bedding Rock or encased in concrete, the trench may be excavated to or just below the designated subgrade provided that the material remaining in the bottom of the trench is no more than slightly disturbed.
5. Where the pipes are to be laid directly on the trench bottom, the lower part of the trenches shall not be excavated to grade by machinery. Manually trim and shape trench bottom to receive pipe at correct line and grade. Shape trench to provide a uniform, continuous support along the entire length of the barrel of each pipe section. Hand-shape firm unyielding bedding so that the bottom segment will be in continuous contact with the pipe barrel.

3.03 PLACEMENT OF MATERIALS

A. Fills

1. Material placed in fill areas shall be deposited within the lines and to the grades shown on the Drawings making due allowance for settlement of the material. Fill shall be placed only on properly prepared surfaces which have been inspected and approved. If sufficient Common Fill material is not available from excavation on site, the Contractor shall provide borrow as required.
2. Fill shall be brought up in substantially level lifts not exceeding 8 inches in depth. The entire surface of the work shall be maintained free from ruts and in such condition that construction equipment can readily travel over any section. Fill shall not be placed against concrete structures until they have attained sufficient strength.
3. During the process of placing fill, all roots, debris and stones greater in size than specified herein shall be removed from the fill areas and the Contractor shall assign a sufficient number of employees to this work to insure satisfactory compliance with these requirements.
4. If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layer, it shall be loosened by harrowing or by another approved method before the succeeding layer is placed.
5. All fill materials shall be placed and compacted "in-the-dry". The Contractor shall dewater excavated areas as required to perform the work in such a manner that will preserve the undisturbed state of the natural soils. The Contractor shall not claim excavated material as unsuitable due to moisture content. The Contractor shall sufficiently dewater excavated materials for use as backfill.
6. Prior to filling, the ground surface shall be prepared by removing vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials. Plow strip or break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with the existing surface.
7. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each classification.

B. Bedding and Backfilling for Pipes

1. Bedding for pipe shall be as shown on the Drawings. The Contractor shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion or loosening of this bed.

2. Backfilling over and around pipes shall begin as soon as practicable after the pipe has been laid, jointed and inspected and the trench filled with suitable material to the mid-diameter of the pipe. All backfilling shall be prosecuted expeditiously and as detailed on the Drawings.
 3. After the pipe is laid to line and grade, place and carefully compact pipe bedding material for the full width of the trench to the springline of the pipe. Place the material around the pipe in 6-inch layers and thoroughly hand tamp with approved tamping equipment supplemented by "walking in" and slicing with a shovel to assure that all voids are filled. Place backfill in 6-inch layers and carefully compact the area above the pipe springline with pipe cover material to a point 12 inches above the top outside surface of the pipe barrel. Pipe bedding material may, at the Contractor's option, be substituted for pipe cover material. The backfilling shall be carried up evenly on both sides of the pipe. The remainder of the trench backfill shall then be filled and thoroughly compacted in uniform layers not exceeding 12 inches in depth.
- C. Backfill around structures shall be placed in uniform layers not exceeding 8 inches in depth. Backfill material shall be Common Fill meeting requirements set forth in Paragraph 2.01. All backfill shall be placed and compacted "in-the-dry." Backfill operations around structures shall not be started until the concrete has attained sufficient strength to resist the loads imposed by the backfill material.

3.04 COMPACTION

A. General

1. The Contractor shall control soil compaction during construction to provide the densities specified. It shall be the Contractor's responsibility to notify the Engineer in writing that compaction tests can be performed. Written notice from the Contractor shall precede completion of compaction operations by at least two (2) working days.
2. Material which is too wet shall be spread over the fill area and permitted to dry, assisted by harrowing, if necessary, until the moisture content is reduced to allowable limits. If added moisture is required, water shall be applied to provide a satisfactory moisture content. If too much water is added, the area shall be permitted to dry before compaction is continued. The Contractor shall supply all hose, piping, valves, sprinklers, pumps, sprinkler tanks, hauling equipment and other materials and equipment necessary to place water in the fill in the manner specified.
3. When a trench or excavation bottom has a density less than that specified herein for the particular area classification, the Contractor shall compact the material to the required depth and percentage of maximum density.

B. Percentage of Maximum Density Requirements

1. All fill and backfill in unpaved areas shall be densified to at least 95% of the maximum dry density as determined by ASTM D1557, unless specified otherwise.
2. All fill and backfill under roadways, driveways, sidewalks, or any other type of paving, shall be densified to at least 95% of the maximum dry density as determined by ASTM D1557.

C. Special Foundation Preparation Requirements for Process Structures and Buildings

1. After clearing, grubbing, and removal of unsuitable materials, the existing ground beneath proposed tanks, building foundations and equipment base slabs and slabs on grade shall be removed and the area proof-rolled. Proof-rolling shall consist of at least 10 passes of a self-propelled roller that imparts a force of not less than 40,000 pounds per drum to the soils. Each pass shall overlap the preceding pass by 30 percent to insure complete coverage. The areas shall be compacted to a density of not less than 95 percent of Modified Proctor Dry Density as determined by ASTM D1557 (latest edition) for a depth of not less than 2-feet below the bottom of the foundations or concrete slabs. Any unsuitable foundation material shall be removed and replaced with Common Fill.
2. Any soft soils found as a result of proof-rolling shall be excavated in accordance with Paragraph 3.02 and replaced with Common Fill placed in lifts not exceeding 8 inches in depth.

3.05 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers.
- B. If, in the opinion of the Engineer, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no additional expense.

3.06 FINAL GRADING

- A. After other earthwork work has been finished, and filling and backfilling operations are completed, all areas on the site of the work which are to be graded shall be brought to grade within a tolerance of +/- 0.1 feet at the indicated elevations, slopes, and contours where seeding or sodding is not required or, where sodding is required, within three (3) inches of finished grade. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to hand work. All surfaces shall be graded to secure effective drainage. Unless otherwise shown, a slope of at least one percent shall be provided.

3.07 EXCESS EXCAVATED MATERIALS

- A. Insofar as needed, suitable excavated materials shall be used in fills and embankments shown on the Drawings. All excess excavated material shall be disposed of off-site by the Contractor.
- B. The Contractor shall segregate different types of excavated materials (i.e. sands, clayey sands) in the stockpile area. All unsuitable materials shall be disposed of by the Contractor offsite in a legal manner.
- C. The Contractor shall slope and compact the stockpile with a light roller to maintain stability.
- D. The Contractor shall maintain proper soil and erosion control measures.

END OF SECTION

SECTION 02822

SOLID SODDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. Furnish all labor, materials, equipment and incidentals required to prepare lawn bed and install sodding as specified.

B. Related Work Described Elsewhere

1. Shop Drawings and Submittals: Section 01340.
2. Earthwork: Section 02200.

1.02 QUALITY ASSURANCE (NOT APPLICABLE)

1.03 SUBMITTALS

- ###### A.
- Provide technical data as required in Section 01340: Shop Drawings and Submittals, regarding all materials or installation procedures required under this Section.

- ###### B.
- Submit representative topsoil samples for analysis by a private laboratory to determine nutrient deficiencies and outline a proper fertilization program.

PART 2 - PRODUCTS

2.01 GENERAL

- ###### A.
- Loam (topsoil) shall be fertile, natural soil, typical of the locality, free from large stones, roots, sticks, peat, weeds and sod and obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain toxic material harmful to plant growth. Topsoil stockpiled under other Sections of this Division may be used, but the Contractor shall furnish additional loam at his own expense, if required.

2.02 SOIL CONDITIONERS

A. Fertilizer:

1. Fertilizer shall be a complete fertilizer, the elements of which are derived from organic sources. Fertilizer shall be a standard product complying with State and Federal fertilizer laws.

2. Fertilizer shall be 6% nitrogen, 6% phosphorus and 6% potash by weight. At least 50% of the total nitrogen shall contain not less than 3% water-insoluble nitrogen.
 3. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis, or a manufacturer's certificate of compliance covering analysis shall be furnished to the Engineer. Store fertilizer in a weatherproof place and in such a manner that it will be kept dry and its effectiveness will not be impaired.
- B. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 20 available phosphoric acid.
 - C. Lime shall be ground limestone.

2.03 SOD

- A. Sod shall be Argentine Bahia of firm texture having a compacted growth and good root development as approved.
- B. Sod shall be certified to meet Florida State Plant Board specifications, absolutely true to varietal type, and free from weeds or other objectionable vegetation, fungus, insects and disease of any kind.
- C. Before being cut and lifted the sod shall have been mowed 3 times with the final mowing not more than a week before cutting into uniform dimensions.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Areas to be sodded shall be cleared of all rough grass, weeds, and debris, and ground brought to an even grade as approved.
- B. The soil shall then be thoroughly tilled to a minimum 8 inch depth.
- C. Loam shall be placed to a minimum depth of 4 inches and shall be lightly compacted. No loam shall be spread in water.
- D. Lime shall be applied at a rate necessary to achieve a pH of 6 to 7.
- E. Apply superphosphate at a rate of 5 pounds per 1,000 square feet and apply fertilizer at a rate of 16 pounds per 1,000 square feet.
- F. The areas shall then be brought to proper grade, free of sticks, stones, or other foreign matter over 1-inch in diameter or dimension. The surface shall conform to finish grade,

less the thickness of sod, free of water-retaining depressions, the soil friable and of uniformly firm texture.

3.02 INSTALLATION

- A. During delivery, prior to planting, and during the planting of the lawn areas, the sod panels shall at all times be protected from excessive drying and unnecessary exposure of the roots to the sun. All sod shall be stacked during construction and protected so as not to be damaged by sweating or excessive heat and moisture.
- B. After completion of soil conditioning as specified above, sod panels shall be laid tightly together so as to make a solid sodded lawn area. On mounds and other slopes, the long dimension of the sod shall be laid perpendicular to the slope and with the joints offset relative to upper and lower panels. Immediately following sod laying the lawn areas shall be rolled with a lawn roller customarily used for such purposes, and then thoroughly watered.
- C. Bring the sod edge in a neat, clean manner to the edge of all paving and shrub areas. Top dressing with approved, clean weed free sand may be required at no additional cost to the Owner if deemed necessary by the Engineer.

3.03 MAINTENANCE

- A. The Contractor shall produce a dense, well-established lawn. The Contractor shall be responsible for the repair and resodding of all eroded or bare spots until project acceptance and during the warranty period. Repair sodding shall be accomplished as in the original work except that fertilizing may be omitted. Sufficient watering shall be done by the Contractor to maintain adequate moisture for optimum development of the lawn areas. Sodded areas shall receive no less than 1.5 inches of water per week. The Contractor shall also mow lawn areas once per week until final completion of the Project.

3.04 REPAIRS TO LAWN AREAS DISTURBED BY CONTRACTOR'S OPERATIONS

- A. Lawn areas planted under this Contract and lawn areas outside the designated areas damaged by Contractor's operations shall be repaired at once by proper sod bed preparation, fertilizing and resodding, in accordance with these Specifications.

END OF SECTION

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DIVISION 11

EQUIPMENT

SECTION 11208

SUBMERSIBLE WASTEWATER PUMPS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. Furnish all labor, materials, equipment and incidentals required and install, place in operation, and field test submersible pumps to be installed in the following locations:
 - a. Plants 2 & 3: 1 Unit for Each Plant (2 Units Total).
2. These Specifications are intended to give a general description of what is required, but do not cover all details which will vary in accordance with the requirements of the equipment as offered. It is, however, intended to cover the furnishing, the shop testing, the delivery and complete installation and field testing, of all materials, equipment and appurtenances for the complete pumping units as herein specified, whether specifically mentioned in these Specifications or not.
3. For all units there shall be furnished and installed all necessary and desirable accessory equipment and auxiliaries whether specifically mentioned in these Specifications or not, and as required for an installation incorporating the highest standard for this type of service including field testing of the entire installation and instructing the regular operating personnel in the care, operation and maintenance of all equipment.
4. In order to provide single source responsibility and compatibility between the various equipment items, control panels, discharge base elbows, guide rails, and wetwell hatches (wet-pit), and base mounting plates and stands (dry-pit) for pumps specified in this Section shall be furnished by the supplier of the pumping equipment.

1.02 QUALIFICATIONS

- A. The pumps covered by these Specifications are intended to be standard pumping units of proven ability as manufactured by a manufacturer having a minimum of five (5) years experience in the production of such pumps. The pumps shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed. Pumps shall be manufactured in accordance with the Hydraulic Institute Standards.

- B. All equipment furnished under this Specification shall be new and unused, shall be the standard product of manufacturers having a successful record of manufacturing and servicing the equipment and systems specified herein for a minimum of five (5) years.
- C. The pumps shall be furnished complete with accessories and shall be manufactured by Xylem (Flygt) or Sulzer (ABS).

1.03 SUBMITTALS

- A. Copies of all materials required to establish compliance with the Specifications shall be submitted in accordance with the provisions of the bidding documents. Submittals shall include at least the following:
 - 1. Shop and erection drawings showing all important details of construction, dimensions and anchor bolt locations.
 - 2. Descriptive literature, bulletins, and/or catalogs of the equipment.
 - 3. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, based on actual shop tests of similar units, which show that they meet the specified requirements for head, capacity, efficiency, NPSH, submergence and horsepower. Curves shall be submitted on 8-1/2-inch by 11-inch sheets, at as large a scale as is practical. Curves shall be plotted from no flow at shut off head to pump capacity at minimum specified TDH. Catalog sheets showing a family of curves will not be acceptable.
 - 4. The total weight of the equipment including the weight of the single largest item.
 - 5. A complete total bill of materials of all equipment.
 - 6. A list of the manufacturer's spare parts to be supplied in accordance with Paragraph 1.06.
 - 7. All submittal data required by the General Conditions.
 - 8. Complete motor data including:
 - Nameplate identification
 - No-load current
 - Full load current
 - Full load efficiency
 - Locked rotor current
- B. In the event that it is impossible to conform with certain details of the Specifications due to different manufacturing techniques, describe completely all nonconforming aspects.

1.04 OPERATING INSTRUCTIONS

- A. Operating and maintenance manuals shall be furnished. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc., that are required to instruct operating and maintenance personnel unfamiliar with such equipment. The number and special requirements shall be as specified in the bidding documents.
- B. A factory representative of all major component manufacturers, who has complete knowledge of proper operation and maintenance, shall be provided for one (1) day to instruct representatives of the Owner and the Engineer on proper operation and maintenance. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

1.05 TOOLS AND SPARE PARTS

- A. One (1) set of all special tools required for normal operation and maintenance shall be provided.
- B. Guaranteed Parts Stock Program: The pump supplier shall have a guaranteed parts stock program in the State of Florida. These parts shall include at least one (1) set of spare parts as listed below for each pump supplied. If the pump supplier does not have a published guaranteed parts stock program, the Contractor shall furnish the specified spare parts for each pump.
 - 1. Upper Mechanical Seal
 - 2. Lower Mechanical Seal
 - 3. Wear Rings
 - 4. Motor Cable
 - 5. Cable Entry Washer/Grommet
 - 6. Complete Set of O-Rings
 - 7. Inspection Plug Washers
 - 8. Impeller Bolt
 - 9. Impeller Key
 - 10. Upper Bearing
 - 11. Lower Bearing

- C. Spare parts shall be properly bound and labeled for easy identification without opening the packaging and suitably protected for long-term storage. Spare parts shall be delivered to the Owner prior to pump station start-up.

1.06 PRODUCT HANDLING

- A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed, and the units and equipment are ready for operation.
- B. All equipment and parts must be properly protected against any damage during a prolonged period at the site.
- C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.
- D. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built and securely bolted thereto.
- E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
- F. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.
- G. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.07 WARRANTY

- A. The pump manufacturer shall warrant the units being supplied against defects in workmanship and material in accordance with Section 01740, Warranties and Bonds. In addition, the manufacturer shall provide an extended prorated warranty for a period of five (5) years.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. The pumping units required under this Section shall be complete including pumps and motors with proper alignment and balancing of the individual units. All parts shall be so designed and proportioned as to have liberal strength, stability, and stiffness and to be especially adapted for the work to be done.
- B. Each discharge base elbow (wet-pit) or mounting plate or stand (dry-pit) for each pump shall be rigidly and accurately anchored into position. All necessary anchor bolts, nuts,

and washers shall be Type 316 stainless steel and shall be furnished by the pump manufacturer for installation by the Contractor.

- C. Stainless steel nameplates giving the name of the manufacturer, the rated capacity, head, speed, and all other pertinent data shall be attached to each pump and motor.

2.02 PUMPS

A. Submersible Applications:

1. The pumps shall be totally submersible non-clog centrifugal pumps with submersible close coupled motors designed to pump sewage. The design shall be such that the pumping units shall be automatically connected to the discharge piping when lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be removed for this purpose, and no need for personnel to enter the pump well. Each pump shall be fitted with a Type 316 stainless steel lifting chain of adequate strength. A 1/4" stainless steel cable, air craft rating, shall be provided between the cable holder and lifting chain.
2. A sliding guide bracket shall be an integral part of the pumping unit. The pump casing shall have a machined connection flange to connect with the cast iron discharge connection, which shall be bolted to the floor of the wet-well with stainless steel anchor bolts and designed to receive the pump connection without the need of any bolts or nuts. Sealing of the pumping units to the discharge connection shall be accomplished by a simple linear downward motion of the pump with the entire weight of the pumping unit guided by two (2) Type 316 stainless steel guides. No portion of the pump shall bear directly on the floor of the sump and no rotary motion of the pump shall be required for sealing. Sealing at the discharge connection by means of a diaphragm, O-ring, or similar method of sealing will be accepted as an equal to a metal-to-metal contact of the pump discharge and mating discharge connection which is specified and required. The pump with its appurtenances and cable shall be capable of continuous submergence under water without loss of watertight integrity to a depth of 65 feet.
3. Lower guide holders shall be integral with the discharge connection. Guide bars for each pump shall consist of two (2) Schedule 40, seamless welded Type 316 L, stainless steel pipes of the size and length required by the pump manufacturer. Upper guide bracket holders shall be provided by the pump supplier to anchor the guides for each pump. The pump supplier shall also provide intermediate guide bar brackets if they are recommended by the pipe manufacturer. All brackets shall be fabricated of Type 316 stainless steel.

- B. Dry Pit Applications: When installed outside of hydraulic structures, pumps shall meet the same general requirements set forth above, however, a ductile iron suction elbow and steel mounting stand or base plate shall be provided in lieu of a pump discharge base and rail system, as shown in the drawings.

- C. The impeller shall be constructed of gray cast iron, ASTM A-48, Class 30. The design shall permit low liquid velocities and gradual acceleration and change of flow direction of the pumped media. The impeller/casing design shall result in a passage free of surfaces to which solid or fibrous materials can adhere. The overall pump design shall combine high efficiency, low required NPSH, large sphere passage and the ability to handle high solids concentrations efficiently. All other parts shall be of close grain gray iron construction, with all parts coming into contact with the pumped liquid protected by an approved sewage resistant coating. Metal surfaces that will be in contact with the pumped liquid, other than stainless steel or brass, shall be protected by a factory-applied spray coating of acrylic dispersion zinc phosphate primer. Exterior surfaces of the pump shall also receive a polyester resin finish coating. All external bolts and nuts shall be of Type 316 stainless steel. The impeller shall be of a centrifugal non-clog type, capable of passing solids and fibrous material of the size specified in Table 11208-A.
- D. Each pump shall be provided with a tandem double mechanical seal running in an oil reservoir, composed of two separate lapped face seals, each consisting of one (1) stationary and one (1) rotating tungsten-carbide ring with each pair held in contact by a separate spring. Lapped seal faces must be hydrodynamically lubricated at a constant rate. The lower seal unit, between the pump and oil chamber, shall contain one (1) stationary and one (1) positively driven rotating tungsten-carbide or silicone-carbide ring. The upper seal unit, between the oil pump and motor housing, shall contain one stationary tungsten-carbide or silicone-carbide ring and one positively driven rotating tungsten-carbide or silicone-carbide ring. The compression spring shall be protected against exposure to the pumped liquid. The pumped liquid shall be sealed from the oil reservoir by one face seal and the oil reservoir from the motor chamber by the other. The seals shall require neither maintenance nor adjustment, and shall be easily replaced. Conventional double mechanical seals with a single spring between the rotating faces, requiring constant differential pressure to effect sealing and subject to opening and penetration by pumping forces shall not be considered equal to tandem seals specified and required.
- E. A wear ring or wear plate system shall be used to provide efficient sealing between the volute and suction inlet of the impeller.
- F. Pump motors shall be housed in an air-filled watertight casing and shall have Class F insulation windings which shall be moisture resistant. Motors shall be NEMA Design B, rated 155 degrees C maximum and shall have a service factor of 1.15. Pump motors shall have cooling characteristics suitable to permit continuous operation, in totally, partially and non-submerged conditions. Moisture sensors and integral thermostats shall be provided for all units that operate under partially or totally submerged conditions. Thermostats shall open on excessive motor temperature in accordance with UL2111 and NFPA 70. The protective devices shall be wired into the pump controls in such a way that if the device detects an abnormal condition the pump will shut down. The protective devices shall be self-resetting. The cable shall be fixed to the pump using a watertight assembly. The pump shall be capable of running continuously in a totally dry condition under full load without damage, for extended periods. The pump shall be capable of sustaining a minimum of ten (10) evenly spaced starts per hour continuously

without damaging the pump or motor in any way. Before final acceptance, a field running test demonstrating this ability, with 24 hours of continuous operation under the above conditions, shall be performed for all pumps being supplied, if required by the Owner. Pump motor cable shall be suitable for submersible pump applications and shall be properly sealed.

- G. The pump cable entry water seal design shall preclude specific torque requirements to ensure a watertight and submersible seal. The cable entry shall be comprised of two (2) cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable. The assembly shall bear against a shoulder in the pump top. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the motor interior from foreign material gaining access through the pump top. Control conductors shall be included in the cable. Secondary sealing systems using epoxy potting compounds are also acceptable.
- H. The junction chamber, containing the terminal board, shall be sealed from the motor by an elastomer compression seal (O-ring). Connection between the cable conductors and stator leads shall be made with threaded compressed type binding posts permanently affixed to a terminal board and thus perfectly leak proof.
- I. Each pumping unit and its driving equipment shall be designed and constructed to withstand the maximum turbine run-away speed of the unit due to back flow through the pump.
- J. Performance Requirements: The pumps furnished shall meet the "Performance Requirements" set forth at the end of this Section in Table 11208-A. The brake horsepower required by each pump shall not exceed the nameplate horsepower of the pump drive motor over the entire pump-operating curve.

2.03 SHOP PAINTING

- A. Before exposure to weather and prior to shop painting, all surfaces shall be thoroughly cleaned, dry and free from all mill-scale, rust, grease, dirt and other foreign matter.
- B. All pumps and motors shall be shop coated, with manufacturer's standard coating.
- C. All nameplates shall be properly protected during painting.
- D. Gears, bearing 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 periods of storage and erection and shall be satisfactory to the Engineer up to the time of the final acceptance test.

2.04 ACCESS HATCHES AND ACCESSORIES

- A. Access hatches shall be provided for all openings in the top. Each hatch shall include an extruded aluminum frame incorporating a continuous concrete anchor and shall be complete with hinges and slide bar equipped covers. Each hatch shall include stainless steel pump guide bar holders. Hatch frames and covers shall be constructed of aluminum and designed for a live load of 300 pounds per square foot. Hatch doors shall be of aluminum checkerplate with reinforcing ribs as required to meet the specified design criteria. All hardware for hatches shall be stainless steel. All aluminum surfaces that will be in contact with concrete shall be coated with a high-build paint, applied by the hatch manufacturer, in order to protect the aluminum. Hatches shall be Series S1R with safety grate as manufactured by Halliday Products, Inc. or an approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations and in the locations shown on the Drawings. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations. Anchor bolts shall be set in accordance with the manufacturer's recommendations.
- B. The Contractor shall submit a certificate from the equipment manufacturer stating that the installation of the equipment is satisfactory, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication and care of each unit.
- C. The services of a factory representative shall be furnished for one (1) day and he shall have complete knowledge of proper operation and maintenance to inspect the final installation and supervise the test run of the equipment.
- D. Pumps:
 - 1. After all pumps have been completely installed, and working under the direction of the manufacturer, conduct in the presence of the Engineer, such tests as are necessary to indicate that pumps conform to the Specifications. Field tests shall include all pumps included under this Section. Supply all electric power, water or wastewater, labor, equipment and incidentals required to complete the field tests.
 - 2. If the pump performance does not meet the Specifications, corrective measures shall be taken, or pumps shall be removed and replaced with pumps which satisfy the conditions specified. A 24-hour operating period of the pumps will be required before acceptance. During this 24-hour operating period, the Contractor shall supply all power necessary.

3.02 FIELD TESTING

- A. Field tests shall not be conducted until such time as the entire installation is complete and ready for testing. Upon completion of all the mechanical work, the Contractor shall conduct testing as specified herein to demonstrate that the equipment performs in accordance with all specifications.
- B. The Contractor shall perform initial testing of the equipment ensuring to himself that the tests listed in the Final Acceptance Test paragraph below can be satisfactorily completed.
- C. The Contractor shall give written notice, seven (7) days in advance, of the date of Final Acceptance Test to the Owner and Engineer. All tests shall be in conformance with other applicable Sections of these Specifications.
- D. The Final Acceptance Test shall demonstrate that all items of these Specifications have been met by the equipment as installed and shall include, but not be limited to, the following tests:
 - 1. That the quick release lift-out feature functions properly and allows the pump to be raised and lowered without draining the pit.
 - 2. That all units have been properly installed and are in correct alignment.
 - 3. That the units operate without overheating or overloading any parts and without objectional vibration.
 - 4. That there are no mechanical defects in any of the parts.
 - 5. That the pumps meet the specified hydraulic requirements.
 - 6. That the pumps shall be capable of pumping raw, unscreened sewage.
 - 7. That the pump sensors and controls perform satisfactorily as to sequence control, correct start and stop elevations, and proper alarm functions.
- E. In the event that the equipment does not meet the Final Acceptance Test, the Contractor shall, at his own expense, make such changes and adjustments in the equipment which he deems necessary and shall conduct further tests until full satisfaction is indicated by the Engineer and written certification is received thereof.
- F. The Owner will pay the salaries of the personnel selected by the Owner for operation of the equipment. Payment of all other salaries, public utility services, and operating expenses shall be borne by the Contractor for the test period and any additional test period required.

3.03 PUMP PERFORMANCE SCHEDULE

- A. Pumps shall be furnished according to "Table 11208-A, Pump Performance Schedule" below.

TABLE 11208-A
PUMP PERFORMANCE SCHEDULE

Parameter	Backwash Drain Pump Station
Number of Pumps	2
Pump Type	Wet-Pit Submersible Pump
Type of Drive	Constant Speed
Design Capacity per Pump, GPM/Ft. TDH	1,400/10
Minimum Efficiency at Design Capacity, Percent	65
Minimum Size Solids, In.	3
Minimum Suction Size, In.	N/A
Minimum Discharge Size, In.	6
Maximum Horsepower Per Pump, HP	12

END OF SECTION

SECTION 11212

SKID MOUNTED METERING PUMPS AND ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall furnish all materials, services, equipment and incidentals as shown, specified and required to assemble, shop test, furnish, field test and place in satisfactory operation a MicroC diaphragm chemical metering pump skid as shown on the Drawings and as specified herein.
 - 1. The chemical feed system shall be completely assembled, mounted, calibrated, tested, and delivered to the site on a single skid. Components to be mounted on the skid are as indicated on the Drawings and shall include the metering pumps, calibration column, piping, valves, piping accessories (pulsation dampeners, strainers, etc.), and wiring integral to the skid. The chemical feed system supplier shall be responsible for providing all equipment, valves and piping within the skid boundary. It is the Contractor's responsibility to provide consistent valve model manufacturers and model numbers throughout the chemical feed system.
 - 2. All equipment supplied shall be in complete conformity with these Specifications and all other applicable Sections. All equipment specified herein is intended to be new standard equipment for use in the liquid chemical feed systems.
 - 3. These Specifications are intended to give a general description of what is required but do not cover all details which will vary in accordance with the requirements of the equipment as offered. It is, however, intended to cover the furnishing, shop testing, delivery, complete installation, and field testing of all materials, equipment, and appurtenances for the complete feed systems as herein specified, whether specifically mentioned in these specifications or not.
 - 4. For all units, furnish and install all necessary and desirable accessory equipment and auxiliaries whether specifically mentioned in these specifications or not. This installation shall incorporate the highest standards for the type of service shown on the Drawings, including field testing of the entire installation and instruction of the regular operating personnel in the care, operation, and maintenance of all equipment.

1.02 QUALITY ASSURANCE

- A. A single manufacturer, who shall demonstrate previous experience in the design and fabrication of skid-mounted chemical metering systems, shall provide the products of this section. The manufacturer must have a service center with trained direct company employed technicians authorized to make repairs to all components of the chemical feed system located within the State of Florida. This supplier shall be responsible for providing all equipment, accessories, spare parts, documentation and installation supervision required for a complete and operational chemical feed system.
- B. The pump skids shall be a regularly marketed product of the manufacturer who must have a physical plant, technical and design staff, and production personnel to complete the work as specified. Systems assembled by second party fabricators, integrators, equipment distributors/representatives, contractors or manufacturers not normally engaged in chemical metering skid design and manufacturing shall not be acceptable.
- C. The manufacturer shall have a minimum of 5 years experience with a successful record of manufacturing and servicing of systems as specified herein. The manufacturer shall have a proven track record of after market sales and service support on its equipment.
- D. To ensure quality and unit responsibility, the pump skids must be assembled and tested by the skid manufacturer at their facility and be a standard and regularly marketed product.
- E. The design and fabrication of the chemical metering skids shall comply with the following criteria:
 - 1. Systems shall be designed completely in AutoCAD or Revit prior to fabrication.
 - 2. The metering skid shall be fabricated from white ½" PVC Type 1 sheet that is thermally welded resulting in a unitary piece of construction. Rotationally molded or skeletal frame skid construction is not acceptable.
 - 3. The PVC sheet shall be precision cut on state-of-the-art CNC equipment using information from the project specific CAD drawings for each system. Hand cut (non-CNC) sheet construction is not acceptable.
 - 4. All piping shall be fabricated to CAD-based production drawings that detail all pipe nipples, fittings, valves, metering accessories, clamp locations, etc. These drawings shall become a permanent part of the production file maintained by the manufacturer so that all or any portion of the piping can be prefabricated by the manufacturer and replaced in the field without any pipe cutting, gluing, welding etc. required. Hand built or reverse engineered piping assembly not based on CAD drawings is not acceptable.
 - 5. All power and control wiring as indicated on the process and instrumentation drawings shall terminate in a NEMA 4X terminal junction box (TJB) providing the site electrical contractor with a single point termination for each system. Any

devices installed within the metering skid boundary that require power or interface connection to remote systems shall be pre-wired to the TJB by the manufacturer.

- F. The manufacturer prior to delivery shall hydraulically and electrically test each system. Testing shall be documented and include verification of pump performance and response to remote systems using simulation equipment as required. A copy of the shop test report shall be included in the final operation and maintenance manuals for the project.
- G. The equipment shall comply with these referenced standards:
 - 1. American National Standards Institute (ANSI).
 - 2. American Society for Testing and Materials (ASTM).
 - 3. National Electrical Manufacturers Association (NEMA).
- H. The products of this section shall be manufactured by Blue Planet Environmental Systems, Inc., Prominent, Guardian or an approved equal.

1.03 SUBMITTALS

- A. Submit for approval, shop drawings and other data to establish compliance with these specifications, in accordance with the provisions of Section 01340, Shop Drawings and Submittals, and as follows:
 - 1. Equipment catalog cut sheets, descriptive literature, bulletins or other published information for the equipment.
 - 2. Certified shop and erection drawings showing all important details of construction and outline dimensions of all equipment including anchor bolt locations. Provide cross sectional drawings of all pumps and equipment with parts identification and materials specifications and a complete bill of materials for all equipment.
 - 3. a process and instrumentation drawing shall indicate the following:
 - a. All process piping, valves, pumps and accessories installed within the skid boundary including pipe sizes, materials and piping inlet and outlet information.
 - b. All skid mounted electrical/instrumentation switches, controls, indicators etc. including voltage and current ratings for any devices that require a power source.
 - c. All controls, indicators, inputs, outputs and surge protection devices included in the local skid mounted NEMA 4X terminal junction box.

- d. All controls, indicators, inputs, outputs and surge protection devices included for any remote mounted control or interface panels being provided.
 - 4. Detail Layout Drawing – The detail drawings shall include the following:
 - a. Top, front, side and isometric views for the proposed metering systems.
 - b. Top, front and side views shall include accurate overall dimensions and location and dimensions for all piping connections.
 - c. Isometric view shall include callouts indicating all skid mounted components and piping connections.
 - d. A table shall be provided with the quantity, part number, description, P/M kit (if applicable) and recommended maintenance interval for all major equipment items and metering accessories.
 - 5. Terminal box drawing – The terminal box drawings shall include:
 - a. Detail drawing of terminal box back panel layout including all panel mounted components terminals, etc. including details for all field connections.
 - b. The back panel drawing shall include a table with quantity, part numbers and descriptions for all devices.
 - c. Detail drawing of terminal box door layout including all panel-mounted components (lamps, switches, nameplates, etc.).
 - d. The front panel drawing shall include a table with quantity, part numbers and descriptions for all devices.
 - 6. Factory Certificates
 - a. Copy of manufacturer in-house and field-testing certificates.
 - b. Copy of manufacturer installation inspection certificate.
 - 7. Submit a list of the manufacturers' recommended spare parts, special tools and lubricants. The list shall include local source for supply of all parts and professional service.
 - 8. Handling and storage instructions.
- B. In the event that it is impossible to conform to certain details of these Specifications due to different manufacturing techniques, describe completely all nonconforming aspects.

1.04 OPERATING INSTRUCTIONS

- A. Copies of an operating and maintenance (O&M) manual shall be furnished. The manuals shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment lists, descriptions, and necessary information, that are required to instruct operating and maintenance personnel unfamiliar with such equipment. A complete, corrected and approved copy of the shop drawing submittal shall be included with each manual provided. Special requirements for the preparation of O&M manuals shall be as specified in Section 01730, Operating and Maintenance Data.

1.05 TOOLS AND SPARE PARTS

- A. All special tools required for normal operation and maintenance of the equipment shall be furnished with the equipment by the manufacturer.
- B. Provide the following spare parts to the Owner for the chemical metering skid upon delivery of the pump skid. Spare parts shall include all parts required for (2) years of normal maintenance of all components of the chemical metering system. All parts shall be in one box labeled with the skid identification information:
 - 1. One (1) maintenance kit for each chemical metering pump. Maintenance kits shall include but not be limited to diaphragm, check valve seats, gaskets and o-rings.
 - 2. One (1) Maintenance kit for each pressure relief valve.
 - 3. One (1) Maintenance kit for each backpressure valve.
 - 4. (1) Spare bladder for each pulsation dampener.
 - 5. (1) Spare ball valve of each size.
 - 6. Parts list for all serviceable components which includes local sources for supply of all parts and professional services.
- C. Spare parts shall be marked with parts numbers and packed in suitable containers also marked with the parts numbers.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All equipment and parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed, and the units and equipment are ready for operation.
- B. All equipment and parts must be properly protected against any damage during a prolonged period at the site. Pumps and appurtenances shall be stored in a clean, dry, weathertight building.

- C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.
- D. Finished iron or steel surfaces not painted shall be properly protected to prevent rust or corrosion.
- E. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage, and handling.
- F. Each box, crate or package shall be properly marked to show its net weight in addition to its contents.
- G. Handle during delivery, storage and installation in a manner to prevent damage of any nature in accordance with manufacturer's approved instructions.

1.08 WARRANTY AND GUARANTEES

- A. Provide a two (2) year full equipment service/parts warranty in accordance with Section 01740: Warranties and Bonds.
- B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment fails during warranty period, it shall be replaced at no expense to the Owner.
- C. Refer to the General Conditions for additional guarantee and warranty requirements.

2.01 GENERAL

- A. The pumping units required under this Section shall be complete including proper alignment and balancing of the individual units. All parts shall be so designed and proportioned to have liberal strength, stability, and stiffness and to be especially adapted for the service to be performed. Ample room for inspection, repairs and adjustments shall be provided.
- B. All equipment and piping shall be rigidly and accurately anchored into position and all necessary foundation bolts, plates, nuts, and washers shall be furnished and installed. All bolts, nuts, washers, and metal components shall be of Type 316 stainless steel.
- C. Stainless steel nameplates giving the name of the manufacturer, model number, rated capacity, speed, and any other pertinent data shall be attached to each item of equipment.

2.02 PERFORMANCE

- A. The pumping units shall operate without vibration or excessive noise over the operating speed range.
- B. All wetted surfaces of the diaphragm chemical metering pumps and appurtenances shall be suitable for continuous exposure to the chemical being pumped as outlined in the Pump Schedule.
- C. Pumping system shall be designed to meet the performance requirements as specified in Table 11212-A and the following parameters:
 - 1. The pumping units shall be able to perform in the ambient temperature range of 25 to 104 F.
 - 2. The pumping units shall have disc style diaphragms. No tube diaphragms will be allowed.

2.03 DESCRIPTION OF PUMP

- A. The chemical metering pump(s) shall be microprocessor-controlled, motor-driven, reciprocating, mechanically-actuated diaphragm type. The pump shall include integral motor, oil-lubricated or permanently greased lubricated bearings, gear reducer and cam-and-spring drive mounted in an aluminum housing. Housing shall be sealed into an outer plastic housing for corrosion protection.
- B. The liquid end shall be physically separated from the drive unit by a back plate with a weep hole creating an air gap. An elastomer shaft wiper seal shall prevent contamination of the solenoid if the primary diaphragm fails. The diaphragm shall be nylon-reinforced EPDM with PTFE-faced fluid contact surface.
- C. The diaphragm shall be of a convex design fitting into a concave liquid end to minimize dead volume and promote flow of solids in suspension.
- D. The liquid end shall be virgin PVDF. The suction and discharge valve shall be PVDF with PTFE-faced Viton® gasket seals and ceramic valve balls.
- E. Materials of Construction: Materials of construction shall be compatible with the process chemical and shall be as follows, unless alternate materials that may be recommended by the manufacturer are approved by the Engineer during shop drawing submittal:
 - 1. Valve body and seats - PVDF
 - 2. Valve balls - Ceramic or Vented PVC
 - 3. O-rings - FKM/Viton

4. Pump end connections - PVDF
 5. Valve Seats - PTFE
 6. Diaphragm - Steel core vulcanized into nylon-reinforced EPDM with PTFE-faced fluid contact surface
 7. Pump and motor base - Skid Mounted
- F. Stroke length control shall be adjustable manually by means of a stroke length knob, in increments of 1%, from 0% to 100% of stroke length. Stroke length shall be determined by a sensor within the stroke adjustable knob that provides accurate feedback to the electronics of the pump for calibration for LCD display of stroke length. The digital display and optional analog output will calculate, display, and transmit the flow of the pump based on pump speed and stroke length settings.
- G. Stroke frequency control shall be done with an integral VFD and stepper motor pump controller. For the integral controller, the first 1/3 of the frequency in strokes per minute will operate with the stepper motor and frequency greater than 1/3 will operate with the internal VFD. Control shall be switchable between manual or external control. In manual mode, stroke frequency control shall be manually adjusted by touch keypads, with the set stroke rate displayed on the pump's LCD. In external mode, the pump shall be capable of receiving a 4-20 mA input via optional external control cable. The metering pump shall be capable of remote ON-OFF operation using the PAUSE function via a voltage-free contact relay through an optional control cable. Pump shall include TEFC, AC motor.
- H. Vector control or controlled motor magnetization shall be configured into the pump. Such control shall include torque or energy monitoring, allowing for detection of hydraulic defects such as discharge overload, with consequent pump shutdown.
- I. The pump shall include a removable HMI which can be mounted on the pump, wall, on the pump skid, or on the control panel.
- J. The pump shall be calibrated to display pump output in gallons/hour. Calibration shall be maintained when stroke length is altered up to +/-10% on the stroke length knob. If stroke length is altered by more than 10%, a yellow warning light shall illuminate and a flashing message "calib" will appear to avoid uncalibrated chemical feed.
- K. Keypad shall allow for scrolling and display on LCD such parameters as stroke frequency, stroke length, stroke counter, pump output in gals/hr, dosing quantity, mA current input being received by pump, and indication of external mode.
- L. Keypad programming shall allow for selecting fast or slow suction and discharge stroking profiles. Such variable dosing profiles shall allow for potential reduction in NPSH or more laminar discharge stroke.

- M. All surfaces of the pump units shall be factory prepared, primed and finish painted with the manufacturer's standard industrial epoxy coating system suitable for the intended service application.
- N. Chemical metering pumps shall be manufactured by Prominent Sigma 1 or an approved equal for design conditions as listed in Table 11212-A.

2.04 CHEMICAL METERING SKIDS

- A. The chemical metering skids shall be constructed from white PVC sheet with a minimum trade thickness of 1/2". The design of the skid shall include gussets and supports as required for all components and shall be self-supporting. All components of the chemical metering system shall be contained within the skid. The skid shall incorporate spill containment capability and feature a 1/2" FPT connection for containment drain piping. The skids shall be manufactured using continuous welding technology; bolted construction is not acceptable. Pedestals shall be provided to elevate the metering pumps above the skid base. The pedestals shall be bolted to the skid base with non-metallic bolts to allow for future pump/piping modifications.
- B. For each chemical metering pump, the piping system shall include (1) pressure relief valve; (1) pulsation dampener; (1) diaphragm protected pressure gauge; (1) back-pressure/anti-siphon valve; (1) flushing inlet; (1) flushing outlet and all required piping, valves and supports. Piping shall include isolation valves and unions for all serviceable components. The chemical supply piping shall feature a y-strainer, and a calibration column shall be provided and designed for use with all the metering pumps. The discharge piping shall provide outlets as indicated in Table 11212-A. The pump connections shall be designed with replaceable pipe sections on the suction and discharge via union or flange so that pump replacement or upgrade can be accomplished without cutting into skid piping.
- C. The piping shall be attached to the chemical metering skid with a non-metallic corrosion resistant support system. All support channels shall be welded to the skid, bolted supports are not acceptable. The straps shall be removable and reusable to allow for servicing of the system. All inlet/outlet connections, valves and pump accessories shall be clearly labeled on the skid for easy identification.
- D. All power and control wiring as indicated on the process and instrumentation drawings shall terminate in a FRP NEMA 4X terminal junction box (TJB) providing the site electrical contractor with a single point termination for each system. Any devices installed within the metering skid boundary that require power or interface connection to remote systems shall be pre-wired to the TJB by the manufacturer.
- E. A power outlet with weatherproof cover shall be provided for all metering pumps and accessories that require an outlet. The inside cover of the terminal box shall include a wiring diagram detailing the function of all terminals. A power disconnect switch shall be provided in the terminal junction box. Surge protection shall be provided locally in the skid mounted terminal junction box. Protection shall be provided for the main

power supply as well as all analog input and output signals. Surge protection devices shall be as manufactured by EDCO Inc. of Florida.

F. The NEMA 4X TJB shall provide the following I/O at a minimum:

1. Terminals for 120VAC power (local heavy duty surge protection included).
2. 15A Breaker for Main AC Power.
3. HOA Selector Switch for each pump.
4. DI = Run Command for each pump.
5. AI = Speed Command for each pump (local surge protection included)
6. AO = Speed feedback for each pump
7. DO = Remote Status for each pump
8. DO = Fault Status for each pump
9. DO = Skid containment leak detection
10. The chemical metering skids shall be completely assembled and tested by the manufacturer prior to delivery to the job site.

G. ACCESSORIES

1. This specification addresses skid mounted chemical metering pump systems complete with the skid assembly containing chemical metering pumps, all necessary piping, valves, fittings, supports, electrical controls, and accessories as specified herein or other specifications in the contract documents. The metering pump skid shall contain the following items:
 - a. Calibration column.
 - b. Pulsation dampeners.
 - c. Pressure gauges with diaphragm seals.
 - d. Ball valves .
 - f. Pressure relief valves.
 - g. Backpressure valves.
 - h. Y strainer.

- i. All piping, gaskets, supports, hardware, wiring, and accessories necessary for a fully functioning skid.
2. Calibration Column: A clear calibration column shall be provided in the chemical supply piping of each system. Manufacturer shall size calibration column specifically for feed system supplied. The piping shall be designed for the calibration column to be used with any of the metering pumps. The calibration column shall be self-filling so that the discharge manifold will allow for filling of the calibration column in the event of non-flooded suction conditions. The top of the calibration column shall allow for connection to rigid piping for "vent" return to supply container. Calibration columns may also be used as de-gassing chambers. All materials shall be compatible with chemicals as listed under Service Conditions and Table 11212-A. Contractor to field route the vent from the calibration column (1/2" Sch 80 PVC) back to the associated bulk storage tank.
3. Pulsation Dampener: Gas charged pulsation dampeners shall be provided and sized for a minimum of 90% dampening. Pulsation dampeners shall include gas charge fitting and 316SS pressure gauge. The dampeners shall be installed in the discharge piping of each metering pump, as close to the metering pump discharge check valve as possible. Pulsation dampeners larger than 10 cu. in. shall attach to the piping by ANSI 150# flanges with 316 SS bolts, threaded connections are not acceptable. All materials shall be compatible with chemicals as listed under Service Conditions and Table 11212-A.
4. Back Pressure/Anti-siphon Valve: Back pressure/anti-siphon valves shall be provided in the discharge piping of each metering pump to provide constant back pressure at the chemical metering pump discharge and eliminate siphoning. The back pressure valves shall be fully adjustable from 0 – 150 psi with bodies compatible with chemicals as listed under Service Conditions and Table 11212-A. Valves shall include a Teflon diaphragm and have no metal parts in contact with the chemical.
5. Pressure Relief Valve: Pressure relief valves shall be provided in the discharge piping of each metering pump, prior to any valves, to eliminate the buildup of excess pressure in the system. The pressure relief valves shall be fully adjustable from 0 – 150 psi with bodies compatible with chemicals as listed under Service Conditions and Table 11212-A. Valves shall have a Teflon diaphragm and have no metal parts in contact with the chemical. Output of the pressure relief valves shall return to the pump suction header.
6. Diaphragm Protected Pressure Gauges: 2-1/2" liquid filled pressure gauges with isolators shall be provided for indication of system pressure in the discharge piping of each metering pump. Industrial quality all Type 316 stainless steel gauges shall be utilized. The isolators shall have housings compatible with chemicals as listed under Service Conditions and Table 11212-A and include a Teflon diaphragm and suitable liquid fill. The process connection shall feature a stainless steel reinforcement ring not in contact with the chemical. A fabricated

PVC bracket shall be provided for each pressure gauge to secure the isolator and prevent lateral movement of the pressure gauge.

H. PIPING, VALVES, AND APPURTENANCES:

1. Pipe and fittings for the chemical feed system shall be manufactured of rigid PVC or CPVC material as described below. Fittings shall be heavy-duty Schedule 80 fittings molded of the material described below. Fittings covered under this specification are tees, elbows, couplings, reducer bushings, crosses, adapters, plugs, caps and flanges.
2. All pipe and fittings shall bear the company's name or trademark, material designation, size, applicable IPS schedule, and the NSF mark as indicative of compliance with this specification.
3. All fittings shall be injection molded of PVC fitting compound of cell classification 12454-B or of CPVC fitting compound of cell classification 23447-B as described in ASTM D-1784 Standard Specification for Rigid Polyvinylchloride) Compounds and Chlorinated Polyvinylchloride) Compounds.
4. Fittings shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The fittings shall be commercially uniform in color, opacity, density and other physical properties.
5. All molded threads, internal or external, shall be "blunt start" threads. All threads shall conform to thread standard ANSI/ASME B1 .20.1 for tapered pipe threads. Threads shall measure not more than 1 1/2 threads large or small when checked with a plug gauge or ring gauge.
6. Dimensions and tolerances of sockets shall conform to PVC IPS Schedule 40/80 Socket Dimensions. All reducing bushings shall be designed to provide for a positive and sufficient grip for cementing bushing in place. Waterways shall be smooth and commercially free of flash and irregularities. On tees and 90° elbows, bond lines shall not coincide with the maximum stress area.
7. Assembly shall be performed in a controlled shop environment by the skid manufacturer. All pipe shall be squarely cut on precision equipment with the ends chamfered and deburred. All socket welded connections shall follow the guidelines set by the pipe/fitting manufacturer for proper cleaning, priming and gluing procedures. A heavy bodied solvent suitable for use with all chemicals as listed in Table 11212-A shall be used. All threaded connections will utilize Teflon tape, a suitable thread sealant or a combination of both. Threaded connections shall utilize stainless steel reinforcement rings where applicable to reduce the risk of cracking.
8. Ball Valves: Ball valves shall be of true union design with two-way blocking capability. All O-rings shall be FKM with PTFE seats. PTFE seats shall have elastomeric backing cushion of the same material as the valve seals. Stems shall have double O-rings and be of blowout-proof design. The valve handle shall

double as carrier removal and/or tightening tool. ISO mounting pad shall be integrally molded to valve body for actuation. The ball valves shall have a pressure rating of 230 psi for sizes 1/2" to 3" and 150 psi for 4" at 70 ° F.

9. Metering Pump Controls: Chemical metering pumps shall include built-in microprocessor controls as described above. All metering pump control cables shall terminate in the NEMA 4X FRP control panel mounted to the chemical metering skid.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all equipment and connect all suction and discharge piping and electrical wiring as indicated on the Drawings and in strict accordance with the manufacturer's written instructions, diagrams and recommendations.
- B. Installation of pumps shall include furnishing the required lubricants for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendation.

3.02 FIELD COATING

- A. Surface preparation and coating application shall be in strict accordance with the coating manufacturer's written instructions.

3.03 INSPECTION, TESTING AND STARTUP

- A. General:
 1. Materials and equipment shall be tested or inspected as required by the Engineer, and the cost of such work shall be included in the cost of the equipment.
 2. Furnish the services of a factory representative for three (3) days who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise a test run of the equipment. Provide (1) 8-hour working days of mechanical start-up services. Provide (1) 8-hour working day of process start-up services. Provide (1) 8-hour working day to instruct operating personnel on the operation and maintenance of the system.
 3. The duties of the factory service representative shall be as follows: After the equipment has been installed but before it is operated by others, the representative shall inspect the completed installation for soundness (no damaged or cracked components), completeness, correctness of setting and alignment, that the pumps are free from stresses imposed by attached piping, and for the adequacy and correctness of packing, sealing, and lubricants. The

service representative shall also check out all controls in manual and automatic operation including all alarms and emergency shutdown controls. The service representative shall start up the equipment in the presence of the Contractor, the Engineer and the Owner's operating personnel and instruct the Owner's personnel in proper operation and maintenance procedures, start-up/shut down procedures, response to emergency conditions and troubleshooting. The responsibility of the Contractor with regards to start-up shall be fulfilled when the start-up is complete, the equipment is functioning properly and has been accepted by the Owner.

4. Field tests shall not be conducted until the entire installation is complete and ready for testing.
5. The Contractor shall submit to the Engineer six (6) copies of a certified report from the factory service representative of the results of the representative's inspections, adjustments, testing and start-up. The report shall include descriptions of the inspections, adjustments made, and the start-up. The report shall also include a statement that the equipment is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void. Final payment shall not be made to the Contractor until this report has been submitted to and approved by the Engineer.

B. Pump:

1. After all pumps have been completely installed and working under the direction of the manufacturer, conduct in the presence of the Engineer, tests necessary to indicate that pump operation, efficiency and discharge capacity conform to these specifications. Field tests shall include all pumps under this section. Supply all pump lubricant, oil, grease, power, water, labor, equipment, and incidentals required to complete the field tests.
2. If the pump performance does not meet these Specifications, corrective measures shall be taken or pump shall be removed and replaced with a pump which satisfies the conditions specified. A 24-hour operating period of the pump will be required before acceptance.

C. Motor:

1. The Contractor shall check all motors for correct clearances and alignment and for correct lubrication in accordance with the manufacturer's instructions. The Contractor shall check direction of rotation of all motors and rewire connections if necessary.

D. Pump Field Testing:

1. A manufacturer's representative, knowledgeable with all major component and who has complete knowledge of proper operation and maintenance shall be provided for one (1) day to instruct representatives of the Owner and the

Engineer on proper operation and maintenance. This work may be conducted in conjunction with the inspection of the installation and test run as provided herein with the Owner's permission. If there are difficulties in operation of the equipment due to manufacturer's design or fabrication, additional services shall be provided at no cost to the Owner.

2. Upon completion of all the mechanical work, the Contractor shall conduct testing as specified herein to demonstrate that the equipment performs in accordance with all specifications.
 3. The Contractor shall perform initial testing of the equipment to ensure himself that the tests listed in the Demonstration Test paragraph below can be completed.
 4. The Demonstration Test shall demonstrate that all items of these Specifications have been met by the equipment, as installed, and shall include the following tests:
 - a. That each pump can deliver the specified discharge flow at rated pressure.
 - b. That the pump controls perform satisfactorily.
 - c. That each integral adjustable speed drive unit operates properly.
 5. If the equipment does not meet the requirements of the Demonstration Test, the Contractor shall, at his own expense, make changes and adjustments in the equipment which he deems necessary and shall conduct further tests until written certification is received from the Engineer.
- E. The Contractor's attention is directed to the fact that the services specified represent an absolute minimum acceptable level of service and are not intended to limit the responsibilities of the Contractor to comply with all requirements of the Contract Documents. The Contractor shall procure, at no additional cost to the Owner, all services required, including additional or extended trips to the jobsite by manufacturer's representatives, to comply with said requirements.

TABLE 11212-A
Design Parameters

Item	MicroC Skid
Number of Skids	1
Number of Pumps per Skid	3
Liquid Pumped	MicroC
Spec. Gravity of Liquid	1.3
Max Capacity (gallons/hour)	4.0
Max Back Pressure (psig)	145
Injection Points	Second Anoxic Basins within Treatment Basins No. 1 & No. 2
Suction Pressure	5 Foot Suction Lift Required
Maximum Back Pressure at Design Capacity (psig)	100
Pump Type	Motor-driven mechanically actuated diaphragm with built-in microprocessor controls
Min. Motor Rated Output (kW)	0.09
Liquid End Material	PVDF/Cer/PTFE
Stroke Length Control	Manual
Stroke Rate Control	Manual and 4-20 mA
Pump Skid Piping Material	Schedule 80 PVC
Type Valves	Ball Valves
Number of Skid Piping Outputs	2

END OF SECTION

SECTION 11287

WEIRS AND GATES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, equipment and incidentals required and install the weirs and gates and appurtenances as shown on the Drawings and specified herein.
- B. General Design:
 - 1. All weirs and gates specified herein shall be mounted as shown on the Drawings.
 - 2. Gate leakage shall not exceed 0.1 gallons per minute (gpm) per foot of seating perimeter for gates in a seating head arrangement. Gate leakage shall not exceed 0.2 gpm per foot of seating perimeter for gates in an unseating head arrangement.
 - 3. Each gate shall not deflect more than $1/360$ of the span of the gate under the design head which shall be defined as the distance from the water surface to mid-height of gate.
 - 4. Gates shall be supplied in accordance with the Gate Schedule shown on the Drawings. The schedule shall be verified by the Contractor.

1.02 QUALITY ASSURANCE

- A. Qualifications:
 - 1. The gates specified under this Section shall be furnished by a manufacturer who is fully experienced, reputable, and qualified in the manufacture of the equipment furnished with a minimum of five (5) years of experience in that field.
 - 2. The safety factors that shall be used in the design of all of the equipment are as follows: Working stresses shall not exceed the lower value of the one-third ($1/3$) of the yield strength or one-fifth ($1/5$) of the ultimate strength of the material. The gates and appurtenances shall be designed for installation in the structures shown on the Drawings.
 - 3. All work shall be performed in accordance with the best modern practices for the manufacture of high-grade machinery. All parts shall conform accurately to the design dimensions and shall be free of all defects in workmanship or

material. Gates shall be completely shop assembled to insure the proper fit and adjustment of all parts.

4. All materials shall be new and both workmanship and materials shall be entirely suitable for the service to which they are to be subjected.
5. All materials shall be of a quality to withstand the corrosion, abrasion and stresses to which this equipment will be subjected during fabrication, erection and continuous operation.
6. Testing:
 - a. The completely assembled gates, the in vertical position, shall be shop inspected for proper seating.
 - b. Each gate shall be fully opened and closed in its guide system to ensure that it operates freely. Floor stands shall be shop operated to ensure proper assembly and operation.

B. Standards:

1. Aluminum Weir and Slide Gates: Frame, slides, rails and yokes shall be ASTM B-209 and ASTM B-221 Alloy 6061-T6.
2. Flush Bottom Seals and "J" Bulb Seals: ASTM D-2000 rubber.
3. Stems, Fasteners and Anchor Bolts: Stainless Steel - ASTM A-276.
4. Iron Castings for Bench Stands: ASTM A-126, Class B.

- C. Equipment Manufacturers: The gates and all related equipment shall be designed, constructed and installed with the best practices and methods and shall be manufactured by Hydro-Gate Corp., Whipps, RW, Washington Aluminum Company, Rodney-Hunt or an approved equal.

1.03 SUBMITTALS

A. Materials and Shop Drawings:

1. Copies of all materials required to establish compliance with the Specifications shall be submitted in accordance with the provisions of Section 01340: Shop Drawings and Submittals. Submittals shall include at least the following:
 - a. Certified shop and erection drawings and data regarding gates.
 - b. Literature and drawings describing the equipment and showing all important details of construction and dimensions.

2. In the event that it is impossible to conform with certain details of the Specifications due to manufacturing techniques, describe completely all nonconforming aspects.
 3. Submittals shall clearly identify the location, method of installation and type of operator for each gate to be provided.
- B. Operating Instructions: Operating and maintenance instructions, for each type of gate, shall be furnished to the Engineer as provided in Section 01730: Operating and Maintenance Data.

1.04 WARRANTY AND GUARANTEES

- A. Refer to Section 01740: Warranties and Bonds.

PART 2 - PRODUCTS

2.01 SLIDE GATES AND WEIR GATES

- A. All gates shall be as indicated in the Gate Schedule.
1. The gates, as specified herein and shown on the Drawings, shall be fabricated of aluminum with the guides designed for face mounting on walls or embedding in concrete.
 2. The guides shall be of extruded aluminum incorporating a dual slot design. The primary slot shall accept the plate of the disc, and the secondary slot shall be sufficiently wide to accept the reinforcing ribs of the disc. The guides shall be designed for maximum rigidity, shall have a weight of not less than three (3) pounds per foot and shall be provided with holes for anchor bolts every 12 inches for face mounted units or embedding keyways for embedded units. Guides shall extend beneath the opening a sufficient amount to support the disc in the fully down or open position for downward opening gates and shall extend above the channel to support the full height of the disc when the gate is fully up or in the open position for upward opening gates.
 3. An aluminum angle shall be welded to the guides up both sides of all gates and across the invert of the opening on face mounted gates. A hollow bulb J-seal shall be attached to this angle with stainless steel strips and fasteners. J-seals shall be adjustable and replaceable in the field without removing the gate from the installed position. The seal shall be arranged so that it will deflect a minimum of 1/16 inch.
 4. The invert of embedded frames shall have an angle welded to the lower ends of the guides to incorporate a flush bottom seal that is attached to the bottom of the frame invert. Seals attached to the slide or disc are not acceptable.

5. Where the guides extend above the operating floor, they shall be sufficiently strong so that no further reinforcing will be required. Where required, the yoke to support the operating benchstand shall be formed by two (2) angles welded at the top of the guides to provide a one (1) piece rigid frame. The arrangement of the yoke shall be such that the disc and stem can be removed without disconnecting the yoke. The top of the yoke shall be set so that the centerline of the operator handwheel is 3'-6" above the adjacent walking surface.
 6. The disc or sliding member shall be an aluminum plate reinforced with "U" shaped aluminum extrusions welded to the plate not more than 16 inches apart. The disc shall not deflect more than 1/360 of the span of the gate under the design head. Reinforcing ribs shall extend into the guides so that they overlap the seating surface of the guide.
 7. All parts of the gate shall have a minimum thickness of 1/4 inch.
 8. All necessary hardware and anchor bolts shall be Type 304 stainless steel and shall be furnished by the gate manufacturer.
- B. Operation of each gate shall be by means of an anti-friction handwheel benchstand or pedestal operator, as designated in the Gate Schedule.
1. Anti-Friction Handwheel Benchstand: A bronze operating nut shall be accurately machined and internally threaded to accept the rising stem counterpart. Maximum effort on the handwheel shall not exceed 40 pounds pull to open or close the gate. A position indicator shall be incorporated into the operator system. A transparent stem cover with a rain cap shall be provided above the operator. The lift mechanism shall be capable of withstanding, without damage, an effort of 200 pounds on the handwheel. The operating stem shall be of Type 304 stainless steel and designed to have an L/r ratio of less than 200. The stem shall be designed to withstand at least twice the rated output of the benchstand and to have a minimum diameter of 1-1/2 inches. The stem shall be connected to the disc by means of a cast aluminum stem connector threaded and bolted to the stem and welded to the disc.
 2. Pedestal operators shall be designed for floor mounting above the gates and shall include a vertical shaft and horizontal handwheel. Maximum effort on the handwheel shall not exceed 40 pounds to open or close the gate. A position indicator shall be incorporated into the operator system. A transparent stem cover with a rain cap shall be provided above the operator. The lift mechanism shall be capable of withstanding, without damage, an effort of 200 pounds on the handwheel. The operating stem shall be of Type 304 stainless steel with a minimum diameter of 1-1/2 inches. The stem shall be connected to the disc by means of a Type 204 stainless steel stem connection, threaded and bolted for the stem and welded to the disc. The stem shall have a stop nut on the top to prevent failure of the floor pins.

2.02 STOP GATES

- A. Gates shall be as specified herein and have the characteristics and dimensions shown on the Gate Schedule. Leakage shall not exceed 0.2 gpm/ft of wetted seal perimeter in seating head and unseating head conditions. Each gate shall utilize self-adjusting seals. All structural components of the frame and slide shall be fabricated of aluminum having a minimum thickness of 1/4-inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service. All welds shall be performed by welders with AWS certification. All aluminum in contact with concrete shall be shop coated with a heavy coat of bitumastic paint. Welds shall be cleaned to provide a uniform finish.
- B. Materials: Frame guides and invert shall be 6061-T6 aluminum. Slide and stiffeners shall be 6061-T6 aluminum. Anchor studs, fasteners shall be Type 316, ASTM A276 stainless steel. Invert seal shall be Neoprene ASTM D-2000 or EPDM. Seat/Seal and facing shall be ultra-high molecular weight polyethylene ASTM D4020
- C. The frame guides and invert member shall be constructed of extruded aluminum with a minimum thickness of 1/4-inch. Frame design shall allow for embedded mounting or mounting directly to a wall with stainless steel anchor bolts and grout. Mounting style shall be as shown on the Drawings. A rigid aluminum invert member shall be provided across the bottom of the guides. The invert member shall be of the flushbottom type.
- D. The slide and reinforcing stiffeners shall be constructed of aluminum plate with a minimum thickness of 1/4-inch. The slide shall not deflect more than 1/360 of the span or 1/16 inch, whichever is smaller, under the maximum design head. Reinforcing stiffeners shall be welded to the slide and mounted horizontally. An aluminum lifting handle shall be welded to the top of the slide. Stop gates with widths greater than 24 inches shall be provided with dual lifting handles.
- E. All gates shall be provided with a self-adjusting seal system to restrict leakage in accordance with the requirements listed in this Specification. UHMW polyethylene seat/seals shall be provided to restrict leakage and to prevent metal to metal contact between the frame and slide. A resilient seal shall be provided on bottom portion of the gate. The seal shall be attached to the invert member of the frame or the bottom of the slide and it shall be held in place with stainless steel attachment hardware. Gates that utilize rubber "J" seals or "P" seals are not acceptable.

2.03 ALUMINUM WEIRS

- A. All weirs shall be 1/4 inch aluminum plate 6061-T6 Alloy. Weirs shall be supplied with slots to bolt to the face of concrete walls. Slots shall allow adjustment of each weir and shall be at least 3 inches long. All neoprene gaskets and stainless steel anchor bolts shall be furnished by the weir manufacturer. All material shall have a standard mil finish. All necessary anchor bolts shall be of Type 304 stainless steel and furnished by the weir plate manufacturer.

2.05 PAINTING

- A. Aluminum surfaces that will be in contact with concrete shall be coated with bitumastic epoxy for corrosion protection. The coating shall be applied by the manufacturer of the aluminum item in the factory. The Contractor shall perform touch-up work in the field if the coating is damaged.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation of all gates and guides shall be done by the Contractor in accordance with the manufacturer's recommendations. Frames and guides shall be installed in a true vertical plane with 90-degree corners.

3.02 INSPECTION AND TESTING

- A. Furnish the services of a factory representative for one (1) day who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise a test run of the equipment.
- B. Maximum allowable gate leakage and deflections shall be as defined in Paragraph 1.01
- C. If gates, operators and appurtenances do not meet specified requirements, corrective measures shall be taken by the Contractor, or the equipment shall be removed and replaced with equipment that satisfies the conditions specified.

3.03 HYDRAULIC GATE SCHEDULE

HYDRAULIC GATE SCHEDULE

No.	Type & Location	Assembly Style	Deck Elev/ Invert Elev	Nominal Disc Size	Design Operating Head (ft) Seating/Unseating Condition	Operator Type/Control Style
1	Upward Opening Slide Gate/Wall Application/CCC	Self-Contained	11.75/ 8.00	36" Wide X 42" High	5/5	Yoke with Handwheel Benchstand/Manual
2	Upward Opening Slide Gate/Wall Application/CCC	Self-Contained	11.75/ 8.00	36" Wide X 42" High	5/5	Yoke with Handwheel Benchstand/Manual
3	Upward Opening Slide Gate/Wall Application/CCC	Self-Contained	11.75/ 8.00	36" Wide X 42" High	5/5	Yoke with Handwheel Benchstand/Manual
4	Upward Opening Slide Gate/Wall Application/CCC	Self-Contained	11.75/ 8.00	36" Wide X 42" High	5/5	Yoke with Handwheel Benchstand/Manual

Notes:

1. Field verify dimensions.

END OF SECTION

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DIVISION 13

SPECIAL CONSTRUCTION

SECTION 13220

DOUBLE WALLED CHEMICAL STORAGE TANK

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required to install, field test, complete, and make ready for service one (1) 6,500-gallon double-walled polyethylene storage tank. The tank shall be designed for use with MicroC as shown on the Drawings and as specified herein. The double wall, flat bottom storage tank assemblies will consist of one cylindrical inner primary tank (Type II) and one blended form octagonal outer secondary tank (Type II). Each tank shall be of molded in one-piece seamless construction by rotational molding and the assembly shall be designed to prevent rainwater from entering the containment tank. The containment tank shall be designed to hold a minimum of 115% of the normal fill capacity of the primary tank. Included in this specification are requirements for material properties, design, construction, dimensions, tolerances, workmanship, and appearance.
- B. A leak detection system and connection port to the tank shall be furnished as a part of the work of this Section and shall be complete with the tank system. The leak detection system shall be between the primary and secondary walls.

1.02 SUBMITTALS

- A. Submit to the Engineer for approval, as provided in Section 01340, Shop Drawings and Submittals, shop drawings details of construction and erection as follows:
 - 1. Dimensions of tank, fittings and attachments.
 - 2. Wall thickness calculations per ASTM D 1998-06 using 600 psi design hoop stress @ 100 degrees F.
 - 3. Locations of fittings and attachments.
 - 4. Resin used and a complete manufacturer's specification of the resin used.
 - 5. Molded weight of tanks.
 - 6. Statement that fabrication is in accordance with these Specifications.
 - 7. Samples.
 - 8. Instructions for handling, storage and installation of tanks.
 - 9. Statement that materials and resin used are suitable for intended service.

10. Drawing details for ladder and safety cage as recommended by Manufacturer.

B. Drawing Approval

1. Shop drawings shall be approved by the Engineer in accordance with Division 1: Shop Drawings, Working Drawings, and Samples. Approval of drawings by the Engineer shall not release the Contractor of responsibility of compliance with these specifications. All proposed changes to these Specifications shall be stated in writing.

1.03 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)

1. ANSI B16.5 – Pipe Flanges and Flanged Fittings.

B. American Society of Testing Materials (ASTM)

1. ASTM D618 – Conditioning Plastics and Electrical Insulating Materials for Testing.
2. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
3. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
4. ASTM D883 – Standard Definitions of Terms Relating to Plastics.
5. ASTM D1505 – Density of Plastics by the Density-Gradient Technique.
6. ASTM D1525 – Vicat Softening Temperature of Plastics.
7. ASTM D1693 – ESCR Spec. Thickness .125" F50 – 10% Igepal.
8. ASTM D1998-06 – Standard Specification for Polyethylene Upright Storage Tank.
9. ASTM D2765 – Degree of Crosslinking in Crosslinked Ethylene Plastics as Determined by Solvent Extraction
10. ASTM D2837 – Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
11. ASTM D3892 - Practice for Packaging/Packing of Plastics
12. ASTM F412 – Definitions of Terms Relating to Plastic Piping Systems

- C. Where reference is made to one of the above following standards, the revisions in effect at the time of the bid opening shall apply.

1.04 QUALITY ASSURANCE

- A. Tanks shall be manufactured by a firm that has at least 10 years prior experience in the construction of similar polyethylene tanks. Submit to Engineer list of previous 10 similar use site installations in the past 36 months.
- B. Tanks shall be manufactured by Assmann, Polyprocessing Company, or Snyder.
- C. The type of fitting used in the sidewall of the tank is determined by the tank wall thickness along with the fitting size and the tank radius. Sidewall fittings larger than 2" must be bolted fittings. The gaskets are to be Viton. If bolts or inserts are required for the fittings, they are to be titanium. Threaded bulkhead fittings are to be used on the top of the tank. When possible, the fittings are to be located on the integrally molded flats on the top of the tank. Self-aligning fittings are to be used for fittings located on the dome of the tank. Fill line assemblies shall be PVC, with viton gaskets and titanium hardware.

1.05 WARRANTY

- A. Tank manufacturer shall provide a three (3) year warranty against defects in materials and workmanship and compatibility for sodium hypochlorite service. The warranty period will begin on the date of substantial completion of the project.

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.
- C. Anchor bolts and hold-down devices shall be 316 stainless steel and provided by the Manufacturer.
- D. The manufacturer shall supply a Type 316 stainless steel wind restraint system.

2.02 MATERIALS

- A. Resin classification for the construction of these tanks shall be as follows:
 - 1. Type II - Tanks molded from linear polyethylene resin (not cross-linkable resin).

- B. The material used shall be virgin polyethylene resin as compounded and certified by the manufacturer. Type II tanks shall be made from linear polyethylene resin as manufactured by Exxon Chemical, or resin of equal physical and chemical properties.
- C. All polyethylene resin material shall contain a minimum of a U.V. 8 stabilizer as compounded by the resin manufacturer. Pigments may be added at the purchaser's request, but shall not exceed 0.25% (dry blended) of the total weight.
- D. Mechanical Properties of Type II tank material:

<u>PROPERTY</u>	<u>ASTM</u>	<u>VALUE</u>
Density (Resin)	D1505	0.941-0.948 g/cc
Tensile (Yield Stress 2"/min)	D638	2950 PSI
Elongation at Break (2"/min.)	D638	>1000%
ESCR (100% Igepal, Cond. A, F50)	D1693	550 hours
ESCR (10% Igepal, Cond. A, F50)	D1693	48 hours
Vicat Softening Degrees F. Temperature	D1525	235
Flexural Modulus	D790	129,000 PSI

2.03 DESIGN REQUIREMENTS

- A. Conditions of Service: Each tank will normally be used to store the specified chemical to atmospheric pressure. The tank and appurtenances shall be designed for the storage of sodium hypochlorite.
- B. The minimum required wall thickness of the cylindrical shell at any fluid level shall be determined by the following equation but shall not be less than 0.187 in. thick.

$$T = P \times O.D. / 2 SD = 0.433 \times S.G. \times H \times O.D. / 2 SD$$

T = wall thickness
SD = hydrostatic design stress, PSI
P = pressure (0.433 x S.G. x H), PSI
H = fluid head, ft.
S.G. = specific gravity, g/cm³
O.D. = outside diameter, in.

1. The hydrostatic design stress shall be determined by multiplying the hydrostatic design basis, determined by ASTM D2837 using rotationally molded samples, with a service factor selected for the application. The hydrostatic design stress is 600 PSI at 73 degrees Fahrenheit for Type I and Type II materials. In accordance with the formula in 6.1, the tank shall have a stratiform (tapered wall thickness) wall.
2. The hydrostatic design stress shall be derated for service above 100 degrees Fahrenheit and for mechanical loading of the tank.

3. The standard design specific gravity shall be 1.9.
 4. Maximum diameter shall be 120 inches.
 5. Maximum height shall be 199 inches.
 6. Nominal capacity shall be 6,500 gallons.
- C. The minimum required wall thickness for the cylinder straight shell must be sufficient to support its own weight in an upright position without any external support. Secondary containment tanks shall be designed per the manufacturer's standard containment thickness requirements. The secondary containment shall be configured to allow shipment of the primary tank inside of the secondary tank. The shipment shall be done without the aid of additional spacer blocks which can be lost during shipment causing damage to the tank.
- D. The top head must be integrally molded with the cylinder shell. The minimum thickness of the top head shall be equal to the top of the straight wall. The primary tank top shall be configured to prevent rainwater from entering the secondary containment tank. The primary tank shall be keyed to the secondary tank preventing primary tank rotation. The secondary containment shall have 115% of the normal fill capacity of the primary tank.
- E. The tank shall be designed to provide a minimum of 4 tie-down lugs integrally molded into the top head. The tie-down lugs shall be designed to allow tank retention in wind and seismic loading situations without tank damage. The primary/secondary tank unit shall be configured to allow direct primary tank base retention for seismic load conditions. The base retention unit shall be anchor bolted to an appropriate structure and not require additional spacer blocks.

2.04 DIMENSIONS AND TOLERANCES

- A. All dimensions will be taken with the tank in the vertical position, unfilled. Tank dimensions will represent the exterior measurements.
1. The tolerance for the outside diameter of the primary tank, including out of roundness, shall be per ASTM D1998.
 2. The tolerance for fitting placements shall be +/- 0.5 in. in elevation and 2 degrees radial at ambient temperature.

2.05 TEST METHODS

- A. Test specimens shall be taken from fitting location areas.

B. Low Temperature Impact Test

1. Test specimens shall be conditioned at -40 degrees Fahrenheit for a minimum of 2 hours.
2. The test specimens shall be impacted in accordance with the standard testing methods as found in ASTM D1998. Test specimens < 1/2" thickness shall be tested at 100 ft.-lb. Test specimens > 1/2" thickness shall be tested at 200 ft.-lb.

C. Ultrasonic Tank Thickness Test

1. All tanks shall be measured for tank wall thickness at 6", 1ft., 2ft. and 3ft. on the tank sidewall height at 0° and 180° around the tank circumference with 0° being the tank manway and going counterclockwise per ANSI standard drafting specifications. All tanks shall meet design thickness requirements and tolerances.

D. Hydrostatic Water Test

1. The hydrostatic water test shall be conducted consisting of filling the primary tank to brim full capacity for a minimum of four hours and conducting a visual inspection for leaks.

E. The tank shall be visually inspected to determine such qualities as are discussed in Section 2.06.

2.06 WORKMANSHIP

- A. The finished tank wall shall be free, as commercially practicable, of visual defects such as foreign inclusions, air bubbles, pinholes, pimples, crazing, cracking and delaminations that will impair the serviceability of the vessel. Fine bubbles are acceptable with Type II tanks to the degree in which they do not interfere with proper fusion of the resin melt.
- B. All cut edges where openings are cut into the tanks shall be trimmed smooth.

2.07 TANK FITTINGS (NOZZLES)

A. Nozzles:

1. Nozzles for connecting piping and accessories shall be provided on each tank at the locations and of the sizes indicated on the Drawings or specified herein.
2. Each nozzle for connecting piping and accessories 2-inch in diameter and larger shall be flanged, with flange diameter and drilling conforming to ANSI B16.5, Class 150. Nozzles shall extend at least 3 inches from outside face of tank to face of flange. Gaskets for flanged connections shall be full face; 1/8 inch thick of suitable elastomeric material to resist the attack of the chemical being stored.

3. Nozzles for connecting piping and accessories less than 2-inches in diameter shall be female NPT extending at least 2 inches from the outside face of the tank. Bulkhead fittings may be used in lieu of nozzles for connections to the top of the tanks.
4. The level elements mounting flange on the top of the tank shall be above the maximum liquid level recommended by the level sensor manufacturer. The length of the nozzle shall be as recommended by the level sensor manufacturer. The center line of the nozzle shall be at least 12 inches from the tank sidewall, fill nozzle, and other obstructions.

<u>Quantity</u>	<u>Connection</u>	<u>Nozzle Size (inches)</u>	<u>Location</u>
1	Fill	2	Top
1	Overflow	2	Side @ Top
1	Drain/Feed Pump Suction	2	Side @ Bottom
1	Site Tube	2	Side @ Top
1	Level Probe	6	Top
1	Vent	4	Top

5. Nameplates: Each tank shall be provided with a nameplate to identify the chemical stored. The nameplates shall be made of 316 stainless steel with engraved lettering one inch high and shall be mounted on the tank at a location acceptable to the Engineer. The chemical designation to be engraved on the nameplate shall be as specified herein.
6. Certification Plates: A stainless steel certification plate shall be installed below each storage tank nameplate. The following data shall be included on the certification plate:
 - a. Name of tank fabricator.
 - b. Date of manufacture.
 - c. Product to be stored.
 - d. Maximum allowable concentration, specific gravity and temperature of the specified chemical solution that can be stored safely.
 - e. Equipment identification number shown listed herein.
7. Gaskets for nozzles and tank cover flanges shall be supplied by the tank manufacturer and be of an elastomeric material compatible with the chemical to be stored.

B. Fittings - Threaded Bulkhead

1. Threaded bulkhead fittings are acceptable for above-liquid installation depending on the tank diameter and the placement of the fitting in the tank. Fittings must be placed away from tank knuckle radius and flange lines. Consult the manufacturer for placement questions. The maximum allowable size for bulkhead fittings placed on a curved cylindrical section of tanks 48 in. to 142 in. in diameter is 2 inch. Tank wall thickness must be considered for bulkhead fitting placement. The maximum wall thickness for each fitting size is shown below.

<u>Fitting Size</u>	<u>Maximum Wall Thickness</u>
1/2 in.	0.750 in.
3/4 in.	0.875 in.
1 in.	0.875 in.
1 1/4 in.	0.875 in.
1 1/2 in.	0.875 in.
2 in.	1 in.
3 in.	1.125 in. (Flat Surface Only)

2. The bulkhead fittings shall be constructed of PVC or other specified material. Gaskets shall be a minimum of 1/4" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton, or other specified material.

C. Fittings - Bolted Double 150 lb. Flange Fittings

1. Bolted double-flange fittings are to be used for below-liquid level installation for sizes 2 in. through 4 in. depending on the placement of the fitting in the tank. Fittings must be placed away from tank knuckle radius and flange lines. Consult the manufacturer for placement questions. Allowable fittings sizes based on tank diameter for curved surfaces are shown below.

<u>Tank Diameter</u>	<u>Maximum Bolted Fitting Size Allowable</u>
48 in. - 86 in.	3 in.
90 in. - 102 in.	6 in.
120 in. - 142 in.	8 in.

The bolted double flange fittings shall allow tank wall thickness up to 2 1/2 in.

2. The bolted double flange fitting shall be constructed with 2 ea. 150 lb. flanges, 2 ea. 150 lb. flange gaskets, and the correct number and size of all-thread bolts for the flange specified by the flange manufacturer. The flanges shall be constructed of PVC Type I, Grade I, or other specified material. Gaskets shall be a minimum of 1/4" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton or other specified material. There shall be a minimum of 4 ea.

full thread bolts. The bolts may have gasketed flanged metal heads or bolt heads encapsulated in Type II polyethylene material. The encapsulated bolt shall be designed to prevent metal exposure to the liquid in the tank and prevent bolt rotation during installation. The polyethylene encapsulation shall fully cover the bolt head and a minimum of 1/4" of the threads closest to the bolt head. The polyethylene shall be color coded to distinguish bolt material (yellow - Hastelloy C276). Each encapsulated bolt shall have a gasket to provide a sealing surface against the inner flange.

3. Standard orientation of bolted double flange fittings shall have bolt holes straddling the principal centerline of the tank in accordance with ANSI/ASME B-16.5 unless otherwise specified.

D. Fittings – Unified Fitting Outlet (UFO™)

1. The UFO shall provide a flexible containment seal between the inner primary tank and the outer secondary containment tank. This fitting outlet when used in combination with fittings provides access for connecting piping to the inner primary tank while maintaining containment integrity between the inner primary tank and the outer secondary containment tank. This fitting outlet may be used for 2, 3, and 4 in. fitting sizes.
2. The fitting outlet shall consist of 1 ea. flexible polyethylene containment boot, 1 ea. appropriate fitting gasket, 1 ea. UFO gasket, 1 ea. solid 304 stainless steel UFO flange, 1 ea. split 316 stainless steel UFO flange, and 12 ea. 3/8 in. 304 stainless steel bolt assemblies. Gaskets shall be a minimum of 1/4" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton® or other specified material.

E. Fittings - Siphon Tube Fittings

1. Siphon tubes shall be added to the suction fittings specified. To allow these fittings to provide better tank drainage.

F. Fittings - Self-Aligning Threaded Bulkhead

1. Self-Aligning fittings are available for installation in vapor phase applications on curved surfaces depending on the spherical dome radius and the placement of the fitting on the tank dome. Fittings must be placed away from tank radius. Consult the manufacturer for placement questions. The maximum allowable size for self-aligning fittings placed on a spherical section of the tank is shown below.

<u>Tank Diameter</u>	<u>Maximum Fitting Size Allowable</u>
45 in. - 48 in.	2 in.
64 in. - 142 in.	3 in.

Tank thickness and fitting angle may need to be considered for self-aligning fitting placement. The maximum thickness and installation angles for each fitting size are shown below.

<u>Fitting Size</u>	<u>Maximum Angle</u>	<u>Maximum Thickness</u>
1 in.	27 degrees	1.000 in.
2 in.	25 degrees	0.750 in.
3 in.	20 degrees	1.000 in.

2. The self-aligning fittings shall be constructed of PVC. Gaskets shall be a minimum of 1/4" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton, or other specified material.

G. Flexible Connections

1. All tank fitting attachments shall be equipped with flexible couplers or other movement provisions provided by the tank customer. The tank will deflect based upon tank loading, chemical temperature, and storage time duration. Tank piping flexible couplers shall be designed to allow 4% design movement. Movement shall be considered to occur both outward in tank radius and downward in fitting elevation from the neutral tank fitting placement.
2. The flexible connection shall be manufactured of the same material as the tank or a compatible material with sodium hypochlorite. If an elastomer flexible connection is used, control bolts are required if recommended by the manufacturer. The flexible connection shall be designed for a minimum of 4% movement. The flexible connection shall be designed with 150# flange connections to allow for attachment to the tank and the piping system. The flexible connection is to be attached as close as possible to the tank to reduce stress.

2.08 TANK ATTACHMENTS

A. Tank Attachments – Level Indicator

1. The enclosure is to be an all-plastic design with a NEMA 4X rating. The level indicator shall provide a visual display of liquid level in the tank showing gallonage in measurement of hundreds of gallons along with 4-20 mA output for other alarm or control systems in accordance with Divisions 13 and 16.

B. Tank Attachments – Leak Detector Unit

1. The leak detector unit shall consist of a sensor attached to a flanged port on the chemical storage tank. The sensor is to monitor the interstitial space between the primary and secondary tanks at a location approximately 1 in. above the tank bottom. The indicator box shall be NEMA 4 rated and factory pre-wired for 110 VAC power and discrete input / output signal. The indicator box will include

a push to test status light - the light is on when the sensor is not detecting a liquid.

C. Tank Attachments - Manway and Fill Cap (Non-sealed)

1. Manways shall be 24 in. vented threaded style (minimum opening diameter of 22 in.)
2. All caps and manways shall be constructed of polyethylene material.

D. Tank Attachments – External Fill Pipes

1. External fill pipes shall be provided per the Drawings. All external fill pipes shall be supported at 3-foot maximum intervals with a support structure independent of the tank (ground supported).

2.09 TIE DOWN SYSTEMS

- A. The tie down system shall be designed to withstand 150 MPH wind loads. Tie down systems must meet seismic requirements per IBC 2009 / CBC 2010 code with seismic loads $\leq .445g$ (Seismic Design Category "D" - $F_a=1.0$, $F_v=1.5$, $S_s=1.4$, $S_1=0.5$). Anchor bolts shall be provided by the contractor per the calculations and the base plates for the system.
- B. The tie down system shall be constructed of Type 316 stainless steel.
- C. Wind load calculations shall be done by a Professional Engineer licensed in the State of Florida.

2.10 BOLTS AND NUTS

- A. Bolts shall be Type 316 stainless steel.

2.11 SHOP TESTING

- A. The tank manufacturer shall have quality control procedures adequate to ensure that all fabrications comply with these Specifications. Quality control shall include in process inspections as well as a final inspection by the manufacturer and written records of these inspections. The objective of the manufacturer's quality control and inspection procedure shall be to have the tank comply with the Specifications and Drawings at the time of the first inspection, thus eliminating any need for rework by the manufacturer or a second inspection by the Engineer.
- B. Inspection records shall be made for each tank. Inspection records shall be available to the Engineer. Upon request, the manufacturer shall send a copy of his inspection records to the Engineer for review prior to inspection by the Engineer.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install the tanks in accordance with the Drawings and the Manufacturer's instructions. A manufacturer representative will be required to make a site visit to guide in correct installation requirements and furnish a report back to the Engineer that the tanks have been installed correctly.
- B. All fitting connections must be installed with flexible tubular type connections per the Manufacturers recommendations.
- C. Make all pipe connections to tanks as shown on the Drawings.
- D. Following the field test, tanks and support members shall be anchored in their final position according to the manufacturer's recommendations.

3.02 FIELD TESTING

- A. After installation, each tank connecting pipes, and valving shall be field tested by filling with water. The tank and fittings shall hold water without loss, evidence of weeping or capillary action for a period of 24 hours prior to acceptance. The Engineer may also inspect each tank for defects, damage, and conformance with the Specifications prior to final acceptance.
- B. After testing, the tanks shall be thoroughly cleaned and dried.
- C. Should any defects become evident during inspection, testing, or within the guarantee period, the Contractor shall repair or replace the defective tanks and/or fittings required by the Engineer.

3.03 WARRANTY

- A. The Contractor shall warrant the tanks to be free from defects in materials and workmanship and to be suitable for the applications and chemicals as specified herein.
- B. The tanks shall be warranted for a period of not less than 3 years with the beginning of the warranty period starting on the day of substantial completion of the project.

END OF SECTION

SECTION 13410

INSTRUMENTATION AND CONTROL FOR PROCESS SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish, install, calibrate, test, start-up, and place in satisfactory operation a complete and operating instrumentation and control system.
2. The Work includes, but is not limited to, the following:
 - a. Panels and panel mounted instruments.
 - b. Field mounted instruments.
 - c. Modifications to exiting PLC-4.
 - d. Modifications to existing SCADA and HMI software.
 - e. Field instruments, Ethernet/ Fiber network communication hardware and software required for interfacing various systems to provide one fully integrated system.

B. Coordination:

1. Instrumentation and Controls:
 - a. Providing instruments, and controls are part of the Work by instrumentation and controls (I&C) Subcontractor. Programming of control logic and configuration of human machine interface (HMI) software is part of the Work. Programming of the SCADA System located at the Wastewater Treatment System is also included as part of subcontractor's work.
 - b. Some panels and equipment are furnished under other Specification Sections under this Contract. Coordinate with Suppliers of these panels and equipment to provide fully functional system in accordance with the Contract Documents and that interfaces with Supervisory Control And Data Acquisition (SCADA) system.

- c. SCADA system input/output list identifies inputs and outputs required and is part of this Section. Input/output list is for coordinating signals between equipment provided by other Suppliers and computer system Supplier, and identifying signals to be programmed by CONTRACTOR's configuration Subcontractor. Include Work for CONTRACTOR-furnished control options not on the input/output list at no additional cost to OWNER.
- 2. To centralize responsibility, materials and equipment provided under this Section shall be furnished by a single Supplier.
- 3. With CONTRACTOR, Supplier shall assume the responsibility for adequacy and performance of materials and equipment provided under this Section.
- 4. To the greatest extent possible, provide materials and equipment from a single manufacturer.
- 5. Supplier's Responsibilities:
 - a. Preparing all instrumentation and control equipment submittals in accordance with the Contract Documents.
 - b. Proper interfacing of instrumentation and control equipment with field equipment, instruments, devices, and panels, including required interfacing with packaged control systems furnished by other equipment Suppliers, and required interfacing with the Site's electrical system.
 - c. Review and coordination with manufacturers, Suppliers, and other contracts of Shop Drawings and other CONTRACTOR submittals for equipment, valves, piping, and appurtenances for ensuring proper interfacing of hardware, and locations and installation requirements of inline devices and instrument taps.
 - d. Direct, detailed oversight of installation of instruments, panels, consoles, cabinets, wiring and other components, and related wiring and piping connections.
 - e. Calibrating, source quality control, field quality control, and start-up of the system.
 - f. Responsibility for correction period obligations for instrumentation and control system.
 - g. Training of operations and maintenance personnel in operation and maintenance (including calibration and troubleshooting) of the instrumentation and control system.

1.02 REFERENCES

A. Standards referenced in this Section are:

1. ANSI/ASQ Z1.4, Sampling Procedures and Tables For Inspection By Attributes.
2. ASTM A269, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
3. ASTM A312, Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
4. ASTM A403, Specification for Wrought Austenitic Stainless Steel Piping Fittings.
5. ASTM B88, Specification for Seamless Copper Water Tube.
6. IEEE 802.1 LAN/MAN Bridging & Management
7. IEEE 802.1X, Port Based Network Access Control.
8. IEEE 802.3, Standards Defining Physical Layer and Data Link Layer Media Access Control (MAC) Sublayer of Wired Ethernet.
9. ISA 5.1, Instrumentation Symbols and Identification.
10. ISA 5.4, Instrument Loop Diagrams.
11. ISA 20, Specification Forms for Process Measurement & Control Instruments, Primary Elements & Control Valves.
12. ISO 8802-3, Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.
13. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
14. NFPA 70 (NEC), Article 770, Optical Fiber Cables and Raceways.
15. NFPA 79, Electrical Standard for Industrial Machinery.
16. UL 50, Safety Enclosures for Electrical Equipment, Non-Environmental Considerations.
17. UL 508A, Industrial Control Panels.
18. UL 698A, Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations.

19. UL 2062, Enclosures for Use in Hazardous (Classified) Locations.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Supplier:

- a. Shall be financially sound with at least five years continuous experience in designing, implementing, supplying, and supporting instrumentation and control systems for municipal water and wastewater treatment facilities comparable to the instrumentation and control systems required for the Project, relative to hardware, software, cost, and complexity.
- b. Shall have record of successful instrumentation and control system equipment installations. Upon ENGINEER's request, submit record of experience listing for each project: project name, owner name and contact information, name and contact information for contractor, name and contact information for engineer, approximate contract value of instrumentation and controls Work for which Supplier was responsible,
- c. Shall have at time of Bid experienced engineering and technical staff capable of designing, supplying, implementing, and supporting the instrument and control system and complying with submittal and training requirements of the Contract Documents.
- d. Shall be capable of training operations and maintenance personnel in instrumentation and control applications, and in operating, programming, and maintaining the control system and equipment.
- e. Shall have UL-approved panel shop.

2. Manufacturer: Manufacturers of instrumentation and control equipment furnished under this Section shall be experienced producing similar equipment and shall have the following qualifications:

- a. Shall manufacture instrumentation and control system components that are fully-developed, field-proven, and of standardized designs.
- b. Shall have system of traceability of manufactured unit through production and testing in accordance with ANSI/ASQ Z1.4.
- c. Shall have guaranteed availability clause (99.99 percent, minimum for one year) for microprocessor-based components and appurtenances.
- d. Shall have documented product safety policy relevant to products proposed for the Work.

B. Pre-submittal Conference

1. Schedule and conduct pre-submittal conference for instrumentation and control system within 30 days after acceptance of I&C Subcontractor by OWNER.
2. Required attendance for pre-submittal conference: CONTRACTOR, I&C Subcontractor, ENGINEER, and OWNER. Pre-submittal conference will be 4 hours. Conference will be held at Owner/ Engineer desired or approved location.
3. Purpose of pre-submittal conference is to review manner in which I&C Subcontractor intends to comply with requirements of the Contract Documents before submittals are prepared.
4. Prepare items listed below for presentation at pre-submittal conference. Submit information to ENGINEER two weeks prior to pre-submittal conference.
 - a. List of materials and equipment required for instrumentation and control system, and brand and model proposed for each item.
 - b. List of proposed exceptions to the Contract Documents along with brief explanation of each.
 - c. Sample of each type of submittal specified in this Section. These may be submittals prepared for other projects.
 - d. Flow chart showing steps to be taken in preparing and coordinating instrumentation and control system submittals.
 - e. General outline of types of tests to be performed to verify that all sensors and transducers, instruments, and digital processing equipment are functioning properly.

1.04 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
 - a. Field Instruments:
 - i. Manufacturer's product name and complete model number of devices proposed for use, including manufacturer's name and address.
 - ii. Instrument tag number in accordance with the Contract Documents.
 - iii. Data sheets and manufacturer's catalog literature. Provide data sheets in accordance with ISA 20 and annotated for features

proposed for use. For instruments not included in ISA 20, submit data sheets using a format similar to ISA 20.

- iv. Description of construction features.
 - v. Performance and operation data.
 - vi. Installation, mounting, and calibration details; instructions and recommendations.
 - vii. Service requirements.
 - viii. Dimensions of instruments and details of mating flanges and locations of closed tanks, pipe sizes for insertion instruments, and upstream/downstream straight run pipe lengths required.
 - ix. Range of each device and calibration information
 - x. Descriptions of materials of construction and listing of NEMA ratings for equipment
- b. Panels, Consoles, and Cabinets:
- i. Layout drawings that include:
 - a) Front, rear, and internal panel views to scale.
 - b) Tag number and functional name of components mounted in and on panel, console, or cabinet, as applicable.
 - c) Product information on panel components.
 - d) Nameplate location and legend including text, letter size and colors to be used.
 - e) Location of anchorage connections.
 - f) Location of external wiring and piping connections.
 - g) Mounting and installation details, coordinated with actual application.
 - h) Proposed layouts and sizes of operator interface graphic display panels and alarm annunciator panels.
 - i) Calculations for heating and cooling of panels, as applicable.

- j) Subpanel layouts and mounting details for items located inside control panels.
- ii. Product information on panel components including:
 - a) Manufacturer's product name and complete model number of devices being provided, including manufacturer's name and address.
 - b) Instrument tag number in accordance with the Contract Documents.
 - c) Data sheets and catalog literature. Submit data sheets as shown in ISA 20 and annotated for features proposed for use. For instruments not included in ISA 20, submit data sheets with format similar to ISA 20.
 - d) Description of construction features.
 - e) Performance and operation data.
 - f) Installation, mounting, and calibration details; instructions and recommendations.
 - g) Service requirements
- iii. Wiring and piping diagrams, including the following:
 - a) Name of each panel, console, or cabinet.
 - b) Wire sizes and types.
 - c) Pipe sizes and types.
 - d) Terminal strip and terminal numbers.
 - e) Wire color coding.
 - f) Functional name and manufacturer's designation for components to which wiring and piping are connected.
 - g) Lightning and surge protection grounding, refer to Electrical specification section 16450, Grounding and drawings. .
- iv. Electrical control schematics in accordance with NFPA 79. Drawings shall be in accordance with convention indicated in

Annex D of the NFPA 79. Typical wiring diagrams that do not accurately reflect actual wiring to be furnished are unacceptable. Tables or charts for describing wire numbers are unacceptable.

- v. Stock list or bill of materials for each panel including tag number, functional name, manufacturer's name, model number and quantity for components mounted in or on the panel or enclosure.
- vi. Detail showing anchorage plan of wire bundles between subpanels and front panel mounted devices.
- c. Field wiring and piping diagrams, include the following:
 - i. Wire and pipe sizes and types.
 - ii. Terminal numbers at field devices and in panels.
 - iii. Fiber optic termination designations in the field and in panels.
 - iv. Color coding.
 - v. Conduit numbers in which wiring will be located.
 - vi. Locations, functional names, and manufacturer's designations of items to which wiring or piping are connected.
- d. Proposed operator interface graphics layouts. Each graphic display and process report layout will be subject to modification from CONTRACTOR's submitted format within limits of software package used for development. Implement such modifications in accordance with ENGINEER's comments.
- e. Supervisory Control and Data Acquisition (SCADA) System:
 - i. Submit the following general information:
 - a) Detailed block diagram showing system hardware configuration and identifying model numbers of system components.
 - b) Software listings for operating system, applications, and HMI.
 - c) Software language and organization.

- d) Format, protocol and procedures for data transmission and communications with input/output modules and peripheral devices, including local area network (LAN).
- e) HMI interfacing details, licensing structure, and included functions.
- f) Control and failure modes.
- g) Online and offline capabilities for programming, system utilities, and diagnostics.
- h) Input/Output Information:
 - i) Input/output (I/O) point listing with I/O module cross-reference identification.
 - ii) I/O module cross-reference identification based on I/O address list developed by I&C Subcontractor .
- i) Database listing, including all I/O points.
- j) Suggested detailed format and configuration of log reports, alarm summaries, printer outputs, displays, and graphics.
- k) Proof of Coordination with PLC Systems of packaged equipment suppliers for Membrane BioReactor (MBR) and Fine Screens (FS) equipment PLC and HMI/OIC applications. Show planned locations for integration of MBR and FS PLC I/O and HMI/OIC software applications (I/O addresses, data tables, projects, tags, etc.)

ii. Hardware:

- a) Layout drawings showing front, rear, end and plan views to scale of equipment, I/O components, power supplies, and peripheral devices.
- b) Equipment ventilation requirements.
- c) Interconnection diagrams, including termination details, cable identification list, and cable length.
- d) Drawings showing equipment layout.

- e) Installation requirements, instructions, and recommendations.
- iii. Software:
 - a) Licensing agreement with name of licensee, renewal requirements, release and versions, expiration dates (if any) and upcoming releases scheduled before Project completion. When upcoming releases are expected, provide descriptions, when available, of features that differ from the proposed release.
 - b) Standard technical and instructional documentation covering software for utility, system support, system documentation, display, communications, data logging and storage and diagnostic functions. Submit this information on electronic media.
 - c) Standard technical documentation covering all aspects of the computer system software functions and capabilities, including instruction set description and programming procedures related to monitoring, display, logging, reporting and alarming functions.
 - d) Detailed functional descriptions of application programs explaining control, display, logging and alarming features to be provided and functions to be performed.
- iv. Documentation describing memory type, size and structure and listing size of system memory, I/O and Data Table memory and size of memory available for control programs.
- v. System I/O Loop Wiring Diagrams: Prepare Shop Drawings on module-by-module basis and include the following information:
 - a) Rack numbers, module type and slot number, and module terminal point numbers. Include location and identification of intermediate panel and field terminal blocks and terminal numbers to which I/O wiring and power supply wiring is connected. Identify power supply circuits with designation numbers and ratings.
 - b) Wiring types, wire numbers, and color coding.
 - c) Designation of conduits in which field I/O wiring will be installed.

- d) Location, functional name, tag numbers and manufacturer's module numbers of panel and field devices and instruments to which I/O wiring will be connected.
 - e) Prepare loop wiring diagrams in accordance with ISA 5.4.
- f. Complete point-to-point interconnection wiring diagrams of field wiring associated with the system. Diagrams shall include the following:
 - i. Field wiring between each equipment item, panel, instruments, and other devices, and wiring to control stations, panelboards, and motor starters. Some of this equipment may be specified in other Divisions, CONTRACTOR is responsible for providing complete point-to-point interconnection wiring diagrams for control and monitoring of that equipment.
 - ii. Numbered terminal block and terminal identification for each wire termination.
 - iii. Identification of assigned wire numbers for interconnections. Assign each wire a unique number.
 - iv. Schedule showing the wiring numbers and the conduit number in which the numbered wire is installed.
 - v. Junction and pull boxes through which wiring will be routed.
 - vi. Identification of equipment in accordance with the Contract Documents.

2. Product Data:

- a. Product data for field instruments in accordance with requirements for Shop Drawings in this Section.
- b. Product data for panels, consoles, and cabinets in accordance with requirements for Shop Drawings in this Section.
- c. Product data for field wiring and piping provided for instrumentation and control service and not included under other Sections or contracts.
- d. Product data for SCADA system, including software and hardware. Requirements for software product data are included in requirements for Shop Drawings under this Section.

3. Samples:
 - a. Color charts for finish paint for panels. Provide full range of paint manufacturer's standard and custom colors. Color selection will be by ENGINEER.
 - b. Color charts for FRP panels. Provide full range of panel manufacturer's standard and custom colors. Color selection will be by ENGINEER.
4. Factory Acceptance Test Procedure: Submit factory testing procedures that will be performed to fulfill requirements of the Contract Documents. Test procedure shall include the following:
 - a. Visual inspection of components and assembly.
 - b. Description of hardware operational testing.
 - c. Description of software demonstration.
 - d. Description of testing equipment to be used.
 - e. Sign-off sheets to be used at time of testing.

B. Informational Submittals: Submit the following:

1. Documents to be submitted prior to pre-submittal conference, in accordance with Article 1.3 of this specification.
2. System Software Documentation: Submit preliminary software documentation not later than four weeks prior to scheduled start of factory testing. Software documentation shall include the following:
 - a. Complete printed copies of all programming.
 - b. Complete listing of external and internal I/O address assignments, register assignments and preset constant values with function point descriptions. List unused/undefined I/O and data table registers available.
 - c. Copies of all configured HMI screens.
3. Manufacturer's Instructions:
 - a. Shipping, handling, storage, installation, and start-up instructions.
4. Source Quality Control Submittals:
 - a. Factory test reports and results.

5. Special Procedure Submittals:
 - a. Submit notification to OWNER and ENGINEER at least 14 days before readiness to begin system checkout. Schedule system checkout on dates agreed to by OWNER and ENGINEER.
 - b. Submit written procedure for system checkout to ENGINEER three months prior to starting system checkout. Three months prior to starting system checkout submit written procedure for start-up to ENGINEER.
6. Field Quality Control Submittals:
 - a. Submit the following prior to commencing system checkout and start-up.
 - 1) Completed calibration sheets for each installed instrument showing five-point calibration (0, 25, 50, 75, 100 percent of span), signed by factory-authorized serviceman.
 - b. Field calibration reports
 - c. Field testing reports.
7. Supplier's Reports:
 - a. Installation inspection and check-out report.
 - b. Submit written report of results of each visit to Site by Supplier's service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
8. Qualifications Statements:
 - a. Supplier.
 - b. Manufacturer, when required by ENGINEER.
- C. Closeout Submittals: Submit the following:
 1. Operations and Maintenance Data:
 - a. Submit in accordance with Section 01730, Operating and Maintenance Data.
 - b. Include complete up-to-date system HMI, PLC software documentation. Provide hardcopy and electronic copies.

- c. Include acceptable test reports, maintenance data and schedules, description of operation, wiring diagrams, and list of spare parts recommended for one year of operation with current price list.

2. Record Documentation:

- a. Prepare and submit record documents in accordance with Section 01720, Project Record Documents.
- b. Revise all system Shop Drawing submittals to reflect as-built conditions in accordance with the following.
 - i. Two copies of each revised Shop Drawings and documentation to replace out-dated drawings and documentation contained in operation and maintenance manuals. Submit half-size black line drawings for each drawing larger than 11 inches by 17 inches. Include specific instructions for out-dated drawing removal and replacement with record documents submittal.
 - ii. Half-size black line prints of wiring diagrams applicable to each control panel shall be placed in clear plastic envelopes and stored in a suitable print pocket or container inside each control panel.
 - iii. Submit CADD drawings of the point-to-point interconnection wiring diagrams updated to reflect final as-built equipment information and as-installed field installation information (AutoCAD v2010).

D. Maintenance Materials Submittals: Submit the following:

1. Spare Parts and Test Equipment

- a. General
 - i. Furnish the spare parts and test equipment as indicated below, identical to and interchangeable with similar equipment provided under this Section.
 - ii. Provide source quality control for spare parts as part of factory testing prior to shipment of instrumentation and control equipment.
 - iii. For process sensors and other analog instruments, Supplier shall submit a separate quotation for recommended list of spare parts and test equipment. Separately list and price each item recommended. Spare parts quotation shall include a statement that prices quoted are valid for a period of one year from date of equipment installation and that Supplier understands that

OWNER reserves the right to purchase none, any, or all parts quoted. Upon request, Supplier shall submit documentation that stock of spare parts and test equipment is obtainable within 48 hours of receipt of OWNER's order.

- b. Furnish the following spare parts:
 - i. Five of each type of input/output relay for each quantity of forty or fraction thereof provided under the Contract.
 - ii. One of each type of PLC input/output module or card used.
 - iii. One replacement power supply for each type and size provided under the Contract.
 - iv. One-year supply of all expendable or consumable materials.
 - v. One per quantity of five or fraction thereof of gauges, indicators, and switches provided, complete with diaphragm seals, filled and ready to use.
 - vi. One per quantity of ten or fraction thereof provided, per range of field instruments including insertion type instruments. No spares are required for inline instruments such as magnetic flow meters and flumes or venturis that include flow tubes through which flow is conveyed.
 - vii. Twelve of each type and size of fuse used in instruments.
- c. Furnish the following test equipment:
 - i. Three Fluke, Hewlett-Packard, or equal (latest in series) digital multimeter plus amprobe, high-voltage probe, test leads, case, and other recommended spares and accessories.
 - ii. Tooling required to insert, extract, and connect internal or external connectors, including edge connectors.
 - iii. Special calibration equipment required for system calibration.
 - iv. One thermocouple calibrator, including case.
 - v. Two signal simulators (four to 20 mA DC; one to five VDC), including case. One simulator shall be battery-powered and shall include charger.
 - vi. One portable flow meter calibrator, for magnetic flow meter use only.

2. Software:

- a. Detailed PLC programming; HMI screens shall be provided for Engineer's approval.
- b. Submit copies of programming and configuration files developed specifically for the Project in accordance with Section 01730, Operating and Maintenance Data.

1.05 STORAGE AND HANDLING

- A. Prior to packaging, each manufacturer or Supplier shall securely attach tag number and instructions for proper field handling and installation to each instrument.
- B. Comply with Section 01600, Products, Materials, Equipment and Substitutions.

PART 2 - PRODUCTS

2.01 Equipment Suppliers/ I&C Subcontractor

- A. Subject to compliance with specified requirements, equipment suppliers shall be the following or City approved I&C Subcontractor:
 1. Sanders Company Inc.
 2. Commerce Controls, Inc.
 3. Revere Control Systems
 4. CEC Controls Company, Inc.
- B. References made in these Specifications to specific manufacturer's products are intended to serve as a guide to type, construction, and materials. Listing of a manufacturer does not imply acceptance by Engineer of a manufacturer's particular product, product line, or latest product revision if it does not meet Specifications.
- C. Equipment Supplier: Equipment specified under Sections 13410 and shown on Drawings shall be designed as a system, fabricated or purchased, shipped to Site, and started up by one of the qualified and approved equipment suppliers listed under this Section. Intent is for unit responsibility.
 1. Equipment supplier shall not assign any of its rights or delegate any of its obligations under these Sections without prior written acceptance by Engineer.
 2. Direct purchase of any items in these Sections by Contractor is not in compliance with this Specification and will not be permitted.

3. When a Service Contract is included, it shall be performed by factory-trained personnel employed by equipment supplier. Equipment supplier shall assign a qualified Engineer employed by the supplier as Project Engineer/Project Manager.
 - a. Project Engineer/Project Manager's name shall be forwarded to Contractor and Engineer within 30 days after receipt of a purchase order by equipment supplier.
 - b. Project Engineer/Project Manager shall be focal point for design, fabrication, Contract communications, and shall be responsible for start-up and acceptance. Project Engineer/Project Manager shall be at factory test at Site for start-up and at the Site during entire acceptance procedure. Only qualified and approved equipment suppliers shall be accepted as meeting this Specification.

2.02 SYSTEM REQUIREMENTS

A. Power Supplies:

1. Electrically powered equipment and devices shall be suitable for operation on 115-volt plus-or-minus 10 percent, single-phase, 60 Hertz plus-or-minus two Hertz, power supply. If different voltage or closer regulation is required, provide suitable regulator or transformer at no additional cost to OWNER.
2. Provide appropriate power supplies for field instruments requiring power source less than 115 volts. Power supplies shall be mounted in control panels or enclosures installed near associated instrument or in field panels.
3. Power supplies shall be capable of minimum of 130 percent of maximum simultaneous current draw.
4. Provide power on-off switch or air circuit breaker for each item provided under this Section that requires electric power.

B. Signal Requirements:

1. Control system shall use 4- 20 mA DC analog signals, unless otherwise shown or indicated.
2. Provide signal converters and repeaters where required. Adequately size power supplies for signal converters and repeater loads.
3. Isolate signals from ground.
4. Signals transient DC voltage shall not exceed 300 volts over one millisecond, and shall not have a DC component over 300 volts.

5. Discrete signals shall use 24 vdc unless indicated on drawings.
- C. Surge Protection Requirements:
1. Provide surge protection to protect electronic instrumentation and control systems from surges propagating along signal and power supply cabling. Protection systems shall be such that the protection level shall not interfere with normal operation, but shall be lower than instrument surge withstand level, and be maintenance-free and self-restoring.
 2. Provide instruments in suitable metallic cases, properly grounded. Ground wires for surge protectors shall be connected to good earth ground and, where practical, run each ground wire individually and insulated from other wires. Mount protectors within instrument enclosure or in separate junction box compatible with the area designation coupled to the enclosure.
- D. Miscellaneous:
1. General:
 - a. Instrumentation components shall be heavy-duty types, constructed for continuous service.
 - b. System shall consist of equipment models currently in production.
 - c. Materials and equipment, including cabling and interconnections, shall be in accordance with Division 16, Electrical, and manufacturer's recommendations, unless indicated otherwise in the Contract Documents.
 - d. Materials and equipment shall, where applicable, be in accordance with UL standards and be so marked and labeled.
 2. Logic and control loops shall be fail-safe. Instrumentation components shall return automatically to accurate measurement within 15 seconds upon restoration of power after power failure and when transferred to standby power supply.
 3. Provide surge protection for instruments and other control system components that could be damaged by electrical surges. Provide lightning arresters on both ends of communication lines, except for fiber optic cabling, external to buildings or structures, including leased telephone lines and similar communication lines.
 4. Field-mounted instruments and system components shall be constructed for use in humid and corrosive service conditions. Field-mounted instrument enclosures, junction boxes and appurtenances shall have NEMA rating appropriate for hazardous rating requirements shown or indicated on Electrical/ Mechanical Drawings, instrument data sheets, and elsewhere in the Contract Documents.

5. Miscellaneous hardware such as fittings, fasteners, and screws, be Type 316 stainless steel or other appropriate material to prevent galvanic reactions, and shall be suitable for service intended. Piping stands shall be provided for fastening instruments as required. Provide threaded pipe stands with flange bolted to slab. Use carbon steel piping and flanges painted in accordance with Section 09900, Painting.
6. Data processing equipment and relays with interconnections to field devices shall be wired through field wiring terminal blocks in the panel. Terminals as part of relay base are unacceptable.
7. Arrange panel-mounted instruments, switches, and other devices ergonomically for functional use and ease of maintenance. Similar types of panel-mounted devices shall be by one same manufacturer and of the same model line.
8. Equipment furnished shall be of modular construction and be capable of field expansion through installation of plug-in circuit cards and additional cabinets as necessary.
9. Field- and panel-mounted instruments shall be tagged with equipment number and nomenclature indicated in the Contract Documents; if not so indicated, tag in accordance with approved Shop Drawings.
10. Coordinate ranges and scales specified in the Contract Documents with manufacturer of the equipment actually furnished for operability over the intended range. Complete the coordination prior to submitting Shop Drawings to ENGINEER.
11. Treat field-mounted devices with anti-fungus spray.
12. Protect field-mounted devices from exposure to high and freezing temperatures to provide complete operability under the environmental conditions indicated in the Contract Documents.
13. Fiber Optic (FO) Cable:
 - a. Cable:
 - i. Fiber Optic (FO) cables shall be a minimum of six (6) strands each. Provide multimode graded index, tight-buffered, optical glass fiber cores compatible with LED-based transmission systems and suitable for fiber optic Ethernet LAN standards including the point-to-point fiber optic inter-repeater link (FOIRL) network, and fiber distributed data interface (FDDI) networks.
 - ii. Attenuation losses shall be 3.5 dB per kilometer or less at a wavelength of 850 nanometers and 1.0 dB per kilometer or less

at a wavelength of 1300 nanometer. Minimum bandwidths shall be 160 MHz-km at 850 nm and 500 MHz at 1300 nm.

- iii. Do not use cabling with plastic fiber core construction.
 - iv. Quantity of cables and quantity of fibers in each cable shall be in accordance with this Section and as shown or indicated on the Drawings.
 - v. Provide cabling with required quantity of splitter kits to accommodate the number of terminations shown or indicated for each interconnection box. Splitter kits shall be suitable units manufactured by cable manufacturer.
 - vi. Assemble cable shall be assembled with inner strength members; polyester core separator tape; Aramid yarn, or similar strength members; inner PVC jacket with ripcord; and polyethylene outer jacket with ripcord.
 - vii. Provide a cable outer jacket that is UV-inhibited, fungus-resistant, and flame-retardant.
 - viii. Cable shall be suitable for indoor and outdoor use. Provide cable unaffected by continuous or intermittent submergence in water and damage from lightning strikes.
 - ix. Cable shall be resistant to fuel, petro-chemicals and other caustic or noxious materials.
 - x. Cable shall be UL or ETL OFN in accordance with NFPS 70 (NEC) Article 770-51(D) and NFPS 70 (NEC) Article 770-53(B) rated.
- b. Terminal connector shall be Type ST, non-polishing, mechanical splice suitable for 62.5 micron multimode fiber optic cable. Terminal shall be constructed of composite housing, ceramic ferrule, and fiber stub permanently bonded into the ferrule. Opposite end of fiber stub shall be precisely cleaved and ready for splicing.
 - c. Fiber optic jumper cables shall be three feet in length, 62.5 micron, multimode, and be compatible with fiber optic backbone cable specified in this Section. Provide jumpers with Type ST connector and PVC jacket, furnished by fiber optic backbone cable manufacturer. Jumper cables fabricated at the Site are unacceptable.
 - d. Panel mounted fiber optic patch panels shall be mounted within the panel such that it provides physical protection to the fiber from normal access to the panel interior for maintenance and diagnostic activities. Fiber optic patch panels designated as wall-mounted as indicated on the Drawings

shall be enclosed in NEMA 4X wall-mounted cabinet. Mount fiber optic patch panels designated as distribution rack in EIA standard 19-inch width rack enclosure. Patch panels shall be of modular construction and utilize Type ST connector.

E. Environmental Conditions:

1. Provide control system suitable for continuous operation under the following conditions:
 - a. Indoor Instruments:
 - i. Ambient Temperature: Zero degrees F to 120 degrees F.
 - ii. Relative Humidity: 100 percent, maximum.
 - b. Outdoor Instruments
 - i. Ambient Temperature: -15 degrees F to 120 degrees F.
 - ii. Relative Humidity: 100 percent, maximum.
2. Protect outdoor-mounted field instruments from direct sunlight by providing sunshade for instruments. Construct sunshade out of non-corrosive material. Sunshade shall withstand wind velocity of 150 miles per hour.

2.03 PROCESS TAPS, SENSING LINES, AND ACCESSORIES

A. Water Pressure Sensing Lines and Accessories for Flow and Pressure Transmitters:

1. Material: Copper water tubing, ASTM B88, Type L, drawn temper or annealed.
2. Pressure Rating: Same as connecting pipe.
3. Size: 1/2-inch O.D. for water.
4. Connections: Brass compression type.
5. Shut-off Valves:
 - a. Type: Ball.
 - b. Pressure Rating: Same as connecting pipe .
 - c. Body, Ball, and Stem: Brass.
 - d. Packing: High-density Teflon.

- e. Handle: Nylon with metal travel stops.
 - f. Support Rings: TFE coated brass.
 - g. End Connections: Removable.
6. Manifolds:
- a. Type: Five-valve and three-valve meter manifolds.
 - b. Materials: Type 316 stainless steel body, bonnets, and stems; delrin seats; Teflon packing.
 - c. Manufacturers: Provide products of one of the following:
 - i. Anderson-Greenwood.
 - ii. Swagelok by Crawford.
 - iii. Or equal.
- B. Pressure Tap Sensing Lines and Accessories for Pressure Gauges and Pressure Switches:
- 1. For Process Sensing Taps in Ductile Iron, Steel and Stainless Steel Piping Systems:
 - a. Material and Fittings: Type 304 stainless steel pipe, ASTM A312; and threaded fittings and adapters, ASTM A403.
 - b. Sizes: 1/2-inch diameter minimum for main sensing piping and 1/4-inch diameter gauge and switch connections.
 - c. Pressure Rating: Equal to or greater than the applicable system test pressure as specified in the Contract Documents.
 - d. Accessories:
 - i. For applications not requiring diaphragm seals, provide separate 1/2-inch diameter Type 316 stainless steel threaded ball valve for each gauge and switch.
 - ii. For applications requiring diaphragm seals, provide separate 1/2-inch diameter threaded Type 316 stainless steel ball valve for seal process side shutoff.
 - 2. For Process Sensing Taps in Copper and Thermoplastic Piping Systems:
 - a. Pipe Material and Fittings: Use same type of pipe material and fittings as that used in the process piping system. Provide PVC and CPVC piping in

accordance with Section 15050 – Utility Piping, Fittings, Valves, and Accessories.

- b. Sizes: 1/2-inch diameter minimum for main process sensing piping and 1/4-inch diameter for gauge and switch connections.
- c. Pressure Rating: Equal to or greater than the applicable system test pressure as specified in the Contract Documents.
- d. Accessories:
 - i. For copper piping system taps with or without seals, provide separate 1/2-inch diameter minimum threaded brass or bronze ball valve for each gauge and switch.
 - ii. For PVC and CPVC piping systems with or without diaphragm seals, provide separate 1/2-inch diameter threaded ball valve for process sensing line shutoff.

2.04 PANELS

A. General Provisions:

- 1. Provide electrical components and devices, support hardware, fasteners, and interconnecting wiring and piping required to provide control panels complete and operational.
- 2. Locate and provide hardware so that connections can be easily made and there is ample room for servicing each item.
- 3. Prevent movement by adequately supporting and restraining devices and components mounted on or within panel.
- 4. Provide panels with sub-panels for installation of all internally mounted hardware.
- 5. Provide numbered terminal strips for terminating field wiring and wiring from other panels, unless otherwise shown or indicated.
- 6. Provide copper grounding studs for hardware requiring grounding.
- 7. Provide the following convenience accessories inside each panel:
 - a. One 120 vac, 20-amp duplex, grounding type receptacle.
 - b. One 120 vac LED service light fixture with protective plastic shield for panels two feet by two feet and smaller.

- c. One 120 vac snap switch, to turn on service light, mounted in outlet box with cover and located so that switch is easily accessible from access door.
 - d. Service light with switch and duplex receptacle shall have a dedicated circuit breaker.
- 8. Control of Environment:
 - a. Provide 120 vac thermostatically-controlled fan-driven heater units to maintain stable temperature within enclosure to protect equipment from harmful effects of condensation, corrosion, and low temperatures inside panels.
 - b. Provide automatically controlled closed-loop heat exchangers or closed-loop air conditioners to maintain temperature inside each enclosure at optimum operating temperature rating of components inside the enclosure.
 - c. Each heat exchanger or air conditioner shall have a dedicated, properly-sized and -rated circuit breaker.
 - d. Submit supporting calculations as part of panel Shop Drawing submittal if panel equipment to comply with specified environmental requirements is proposed to be deleted as unnecessary.
- 9. Panels to be located in non-hazardous (non-classified) environments shall comply with UL 50 and UL 508A.
- 10. Panels to be located in hazardous (classified) environments shall comply with UL 698A and UL 2062.
- 11. Provide panels under this Section with 25% percent additional space requirements for future use. Install nothing in space reserved for future use.
- 12. CONTRACTOR is responsible for detailed layout and design of panels, in accordance with the Contract Documents. Base cutouts and design on instrument manufacturers' requirements.
- 13. Lower 12 inches of free standing panels shall be free of devices, including wireways, fiber, network cabling, and terminal strips, for ease of installation and maintenance.
- 14. For front-opening panels, install no device less than three feet above operating floor level, unless otherwise shown or indicated. For rear-opening panels, install no devices on the door.

15. Wire bundles between subpanels and front panel-mounted devices shall be anchored and protected from damage by opening and closing of panel door.
16. Do not locate front panel-mounted devices requiring manipulation by operating personnel, such as pushbuttons, hand switches, controllers, and similar devices, higher than 5.5 feet above finished floor.
17. Wireways located on either side of terminal strips shall have minimum clearance of 1.5 inches between panduit and terminal strip.
18. Provide three-inch high channel base assembly, drilled to mate panel to floor pad.
19. Provide easily-accessible pocket built into panel door to enclose "as built" panel wiring diagrams.
20. Panels shall be UL-listed.

B. Identification:

1. Provide laminated plastic nameplate for identification of panels. Use self-tapping stainless steel screws for fastening nameplates to panels. When self-tapping screws may degrade panel's NEMA rating, retain NEMA rating intact by using gaskets on each side of panel surface and use retaining plate on the panel back that is same size as nameplate. When gaskets and retaining plate are used, use full-penetration screws with nuts.
2. Panel identification nameplates shall have 1/2-inch high engraved letters.
3. Identify front panel-mounted devices with nameplates engraved with functional description of the device. Nameplate engraving shall be in accordance with the identification provided in the Drawings.
4. Tag electric components and devices mounted within panels with high adhesive labels.
5. Identify terminal strips with nameplate engraved as "TB-XX" where "XX" is the numerical identification of terminal strip.
6. Identify terminals within each terminal strip with sequential numbers and wire numbers.
7. Internal panel wiring shall be color-coded and numerically identified with unique wire numbers affixed at each end of each wire. Color coding shall be in accordance with panel wiring color code table, below:

Panel Wiring Color Code Table

Description	Color
110 vac panel power before fuses or breakers	Black
Controlled power operating at voltage less than the supply voltage	Red
power source from devices external to panel	Yellow/ Orange
110 vac neutral	White
24 vdc power from power supplies (Not Grounded)	Blue
24 vdc power from power supplies (Grounded)	Blue w/ White Stripe
Controlled 24 vdc power (e.g., after PLC output contacts, relay contacts, and similar)	Blue
24 vdc four to 20 mA DC signal cable	Red, Black, Bare Shield
Grounding wire	Green

C. Panel Construction Features:

1. Panels located inside control or electric room areas shall be rated NEMA 12 with the following features:
 - a. Fabricate enclosures using minimum 14-gage steel for wall- or frame-mounted enclosures and minimum 12-gage for free standing enclosures. Steel shall be free of pitting and surface blemishes.
 - b. Continuously weld exterior seams and grind smooth. Surface grind panel to completely remove corrosion, burrs, sharp edges, and mill scale.
 - c. Reinforce sheet steel with steel angles where required to adequately support devices and equipment and ensure rigidity and to preclude resonant vibrations.
 - d. Panel shall be flat within tolerance of 1/16-inch over two-foot by two-foot area, or flat within tolerance of 1/8-inch for larger surface area. Acceptable out-of-flatness shall be gradual, in one direction only, and shall not consist of obvious depressions or a series of wavy sections.
 - e. Use pan type construction for doors. Door widths shall not exceed three feet.
 - f. Mount doors with full-length heavy-duty piano hinge with stainless steel hinge pins.
 - g. Provide oil resistant gasket completely around each door or opening.
 - h. Provide handle-operated, oil-tight, key-lockable three-point stainless steel latching system with rollers on latch-rods for easy door closing.

- i. Use stainless steel fasteners throughout.
 - j. Provide interior mounting panels and shelves constructed of minimum 12-gage steel with white enamel finish.
 - k. For prints, provide steel pocket with white enamel finish.
 - l. Provide enclosure mounting supports as required for floor, frame, or wall mounting as required.
 - m. Completely clean interior and exterior surfaces so surfaces are free of corrosive residue, oil, grease, and dirt. Zinc phosphatize for corrosion protection.
 - n. Provide one coat of primer paint to interior and exterior surfaces immediately after applying corrosion protection, in accordance with coating manufacturers' instructions. Provide surface preparation in accordance with coating manufacturer's requirements.
 - o. Paint interior surfaces with two coats of semi-gloss white polyurethane enamel.
 - p. Paint exterior surfaces with minimum of three finish coats of polyurethane enamel to produce a finish that is smooth and free of imperfections. Color shall be selected by ENGINEER from complete selection of standard and custom color charts furnished by manufacturer.
 - q. Primer and finish paint shall be compatible and shall be low-VOC, high-solids polyurethane enamel.
2. Control panels located in non-environmentally controlled areas and outdoor areas shall be rated NEMA 4X and with the following features:
- a. Construct panels of fiberglass mat-reinforced polyester resin, with minimum thickness of 3/16-inch for all surfaces, except areas requiring reinforcement.
 - b. Panels shall be precision-molded to form one-pieced unit with rounded corners.
 - c. Exterior surfaces shall be gel-coated to provide corrosion-resistant, maintenance-free satin finish that does not require painting or other protective coating.
 - d. Color pigments shall be molded into the resin.
 - e. Color shall be selected by ENGINEER from complete selection of standard and custom color charts furnished by manufacturer.

- f. Panels shall have front access doors where rear access is not feasible.
 - g. Provide clear-plastic and gasketed lockable hinged door to encompass non-NEMA 4X front-of-panel devices.
 - h. Hardware, including hinge and means of locking shall be corrosion resistant.
- 3. Control panels located in non-environmentally controlled areas and outdoor areas shall be rated NEMA 4X and with the following features:
 - a. Panels shall be Type 316L stainless steel construction with minimum thickness of 12-gage for all surfaces, except areas requiring reinforcing, with a smooth-brushed finish.
 - b. Stainless steel screw clamp assemblies on three sides of each door.
 - c. Rolled lip around three sides of door and along top of enclosure opening.
 - d. Hasp and staple for padlocking.
 - e. Provide clear-plastic, gasketed lockable hinged door to encompass non-NEMA 4X front-of-panel devices.
- 4. Wall-Mounted Panels:
 - a. General: Wall-mounted panels shall comply with applicable features and standards specified in this Section for the associated NEMA-rated panel.
 - b. Unless otherwise indicated or approved by ENGINEER, depth of wall-mounted panels shall not exceed 18 inches.
 - c. Panels may be all stainless steel, fiberglass, polycarbonate, or acrylonitrile butadiene and styrene (ABS).
 - d. Provide appropriate size and number of external mounting feet.
 - e. Drilled holes or knockouts in back of wall-mounted panels are not allowed.
 - f. Provide corrosion-resistant polyester quick release latches (for non-stainless steel panels) or stainless steel screw clamp assemblies (for stainless steel panels).

D. Electrical Systems:

- 1. Power Source and Internal Power Distribution:

- a. Provide in the panel, near where incoming power is terminated, nameplate with panel power supply source, type, voltage, and circuit number.
- b. Protect incoming 120 vac power feeds to power the panel by providing lightning and surge arrestors, properly connected to grounds.
- c. Provide panels with internal 120 vac power distribution system with properly-sized and -rated circuit breakers to distribute power. Power not more than six devices from a single breaker. When power supplies are included in the panel, not more than two power supplies shall be powered from a single breaker. Convenience receptacles and interior panel lights shall have their own breakers. When one or more field instruments require 120 vac power from the panel for instrument power, power not more than three instruments from a given breaker.
- d. Provide space for a minimum of two spare breakers in each panel.

2. Electrical Systems:

- a. Internal wiring shall be Type MTW and THW stranded copper wire with thermoplastic insulation rated for 600 volts at 85 degrees C for single conductors, color-coded and labeled with wire identification.
- b. For DC signal wiring, use shielded cable with 16-gage conductors. DC field signal wiring terminal strips shall be capable of handling wires up and including No. 12 size.
- c. For AC power wiring, use No. 12 minimum AWG. For AC signal and control wiring, use No. 14 minimum AWG. For wiring carrying more than 15 amps, use sizes required by the NEC (NFPA 70) .
- d. Inside of panels, route DC signal wiring separately from power wiring with minimum separation distance of six inches.
- e. Use covered wireways to route internal panel cables and wiring. Wireways in each section of panel shall be appropriately sized to accommodate the quantity of wires to be routed with a spare capacity of 40 percent.
- f. Install wire troughs inside panels along horizontal or vertical routes to present a neat appearance. Angled runs are unacceptable.
- g. Wiring that is routed without wireways shall be adequately supported and restrained to prevent sagging or other movement. Use of adhesive anchors to support or restrain wiring is unacceptable.

- h. Terminate internal panel wiring using forked, insulated, crimp-on connectors; soldered connectors are unacceptable. Provide panels with 600-volt rated barrier type terminal strips mounted on Din rails. Identify terminal strips as indicated in this Section. Identification devices shall be self-stick, plastic tape strips with permanent, machine-printed numbers.
- i. Wiring in panels shall be installed such that, if wires are removed from any one device, power will not be disrupted to other devices.
- j. Provide spare terminals equal in number to 20 percent of terminals used for each type of wiring (e.g., DC signal and AC power).
- k. Provide ground terminals to terminate the shield wire of shielded cables. Termination of more than two shielded wires on a single ground terminal is unacceptable.
- l. Provide a single copper bus bar with 5/16-inch diameter copper grounding stud to connect the panel to external ground. Panel's internal grounds shall be terminated to the bus bar.
- m. Where wires pass through panel walls, provide suitable bushings to prevent cutting or abrading of insulation.
- n. When DC power or low voltage AC power is required, furnish and install in the panel required power supplies and transformers.
- o. Provide complete wiring diagram of "as-built" circuitry enclosed in transparent plastic.

2.05 Fast Ethernet Switch

A. General:

- 1. Provide equipment to operate on 115 vac, single-phase, 60-Hertz electric service.
- 2. Provide required items for installation, including mounting brackets, interconnecting cables, hardware, and appurtenances.

B. Products and Manufacturers: Provide one of the following:

- 1. 100Base-TX Switch, manufactured by Cisco.
- 2. N-Tron
- 3. Phoenix Contact

C. Features:

1. Minimum of six RJ-45 ports supporting 100 Base-TX transmission over two pair of Category 6A, unshielded twisted pair (UTP) cable.
2. Four Fiber Ports (Multimode) with ST connectors.
3. Jumbo Frames: 10K.
4. MAC Address Table: 8K.
5. Switching Method: Store and forward.
6. Security: IEEE 802.1X, RADIUS authentication, MD5 encryption access.
7. Control: ACLs – drop or rate limit based on: Source and destination MAC-based source and destination IP address protocol TOS/DSCP port VLAN Ethertype.
8. One IEC320 power cord.
9. One expansion cable.
10. Per Unit LEDs: Power status, collision, over temperature.
11. Per Port LEDs: Packet reception, partition, link status.
12. LCD unit ID indicator.
13. Quantity: As shown or indicated on the Drawings.
14. Fast Ethernet hub shall be in accordance with:
 - a. IEEE 802.3u, 100 Base-T compliant.
 - b. IEEE 802.3x flow control, IEEE 803.3ad LACP, IEEE 802.1d STP, IEEE 802.1 Q/p VLAN, IEEE 802.1 Rapid STP, IEEE 802.1s Multiple STP, IEEE 802.1X port access authentication.
 - c. ISO 8802-3.

2.06 DATA SHEETS – PANEL INSTRUMENTS AND PRIMARY SENSORS AND FIELD INSTRUMENTS

A. General:

1. Panel-mounted devices and instruments and primary sensors and field instruments shall be in accordance with the “data sheets” included I Part 3 of this specification.

2. Do not fabricate, ship, or assemble instruments and devices in panels until require Shop Drawings and other submittals required for fabrication are approved or accepted as required.

2.07 IDENTIFICATION

A. Instrument Tagging

1. Headings on the instrument index in the Contract Documents have the following meaning:
 - a. "TAG" is divided into two sections. The first seven to nine alphanumeric characters represent the OWNER's equipment number and the remaining characters comply with ISA Standard S5.1.
 - b. "DESCRIPTION/LOCATION" is an explanation of instrument function and location.
 - c. "RANGE/SET POINT" is the limit for the specified units of the instrument and set point is the precise value within the instrument's range.
 - d. "SPEC REF" is the paragraph reference in the Specifications where the instrument's requirements are specified.
 - e. "DRAWING NO." indicates the Drawing where the device is shown or indicated.
 - f. "REMARKS" contains specific notes relative to the instrument.

B. Input/Output List Identification

1. I/O point list contains information required to configure PLC I/O interface hardware, and to indicate range conversion or signal functions.
2. "Tag" is an alphanumeric character string. For example, for the point "FIR-806" the following apply:
 - a. The first character is the functional identifier and conforms with ANSI/ISA S5.1. In the example, "F" represents flow.
 - c. The second and third charcter (and sometimes fourth and fifth) alphabetical character (I) is the function identifier. In the example, the "I" represent indication input, "R" represents recorded data.
 - d. The next three-digit number (806) identifies the loop or field device.
 - f. Suffix, where required, is used for distinguishing between similar variables.

3. "DESCRIPTION" is an alphanumeric character string up to 40 characters in length. Points described as "SPARE" indicate pre-wired I/O.
4. "SIGNAL TYPE" is one of the following:
 - a. AI indicates analog input.
 - b. DI indicates discrete input.
 - c. PI indicates pulse input.
 - d. AO indicates analog output.
 - e. DO indicates momentary, maintained or latched discrete output.
 - f. ETH indicates Ethernet/IP
 - g. MBE indicates Modbus Ethernet TCP/ IP

C. ISA Identification

1. A = Analytical.
2. B = Burner, Combustion.
3. C = Cooling (Cooling Condenser).
4. D = Dissolved.
5. E = Voltage.
6. F = Flow.
7. G = Intrusion.
8. H = Hand.
9. I = Current.
10. J = Power.
11. K = Time.
12. L = Level.
13. M = Manual.
14. N = UNDEFINED.

15. O = Overload.
16. P = Pressure.
17. Q = Communication.
18. R = Reverse.
19. S = Speed, Frequency.
20. T = Temperature.
21. U = Universal (Common).
22. V = Vibration.
23. W = Torque (Weight or Force).
24. X = Critical (Emergency).
25. Y = Event, State or Presence.
26. Z = Position, Dimension.

D. Function Identifier:

1. A = Alarm
2. B = UNDEFINED.
3. C = Control.
4. D = Differential.
5. E = Element.
6. F = Failure.
7. G = UNDEFINED.
8. H = High.
9. I = Indication.
10. J = UNDEFINED.
11. K = Factor.

12. L = Low.
13. M = Mode.
14. N = Normal.
15. O = Oxygen.
16. P = UNDEFINED.
17. Q = Quantity.
18. R = Rotation.
19. S = Switch.
20. T = Timer
21. U = UNDEFINED.
22. V = Slow (output)
23. W = Slow (input)
24. X = Selector Switch (input)

2.08 PROCESS CONTROL DESCRIPTIONS

A. Introduction:

The purpose of the control strategy is to provide a detailed description of the control, monitoring and alarm functional requirements associated with each process units for the Plant's control system (PCS) to operate the following processes:

Table 1 provides the associated control strategies involved in the Plant's control system. Refer to Section 13500 for detailed descriptions of each Control strategy.

Each control strategy is divided into nine (9) sections:

1. Overview: This section provides a basic performance description as an introductory guide.
2. Monitor: This section provides required equipment operation status, current process variable measurements, totaling process variable measurements, and active equipment control mode status that are to be monitored ('Monitor' does not include alarms):

- a. Equipment operation status includes OPEN or CLOSED position; ON or OFF; and LOW, HIGH or OFF. (OFF is also referred to 'READY' in the electrical schematics wiring diagrams.)
 - b. Current process variable measurements include level, pressure, temperature, flow and analytical measurements (such as pH, TOC, chlorine residual, etc.).
 - c. Totaling process variable measurements include daily, monthly, and annual total measurements; as well as, equipment cumulative runtimes.
 - d. Active equipment control mode status includes REMOTE selected in the field; MANUAL or AUTO selected from the control system interface; PID controller's set point and output; operator entered parameters for control algorithms (such as dosage, timers, etc.); current sequence steps.
3. Control: This section provides required modes of equipment operation, mathematical algorithms, proportional-integral-derivative (PID) controller, and sequencing steps. This section assumes the equipment is placed in REMOTE (from the field). If the equipment is not in REMOTE then the described controls are disabled and the equipment is not available for the PCS.
 4. Transfer Mode: This section provides the functional requirements of transferring from one control mode to another control mode. Where the term 'bumpless transfer' is used to describe the transfer mode. Bumpless transfer is the ability to seamlessly go from one mode to another mode without interrupting the equipment operation.
 5. Interlock: This section provides required control interaction between two or more devices and override functions to protect equipment and process performance under normal operations. 'Interlocks' does not include override actions caused by field generated alarms, equipment or instrument failure, and power outage.
 6. Alarm: This section provides required annunciation, control action and priority of field generated alarms, logic generated alarms, and logic generated warnings. Logic generated alarms and warnings are identified with a  symbol in the control strategy. These alarms include:

Out of Range Analog Input: An analog input is outside of the 4 to 20 mA range for 30 seconds then issue a Out of Range input alarm.
FAIL-to-CLOSE: A CLOSE command is issued and there is no CLOSE status feedback to indicate valve has reached full closed position within 45 seconds or the CLOSE status is not present while valve is commanded to CLOSED position then issue a FAIL-to-CLOSE alarm.
FAIL-to-OPEN: A OPEN command is issued and there is no OPEN status feedback to indicate valve has reached full open position within 45 seconds or

the OPEN status is not present while valve is commanded to OPEN position then issue a FAIL-to-OPEN alarm.
FAIL-to-RUN: A START command is issued and there is no ON status feedback to indicate device has started within 45 seconds or the ON status is not present while device is running then issue a FAIL-to-RUN alarm.
FAIL-to-STOP: A STOP command is issued and there is still an ON status feedback after a 45 seconds from issuing a STOP command then issues a FAIL-to-STOP alarm.
FEEDBACK FAILURE: A PID controller modulates a valve position or pump speed to maintain a process set point under AUTO mode and the controller's feedback used to determine off set from set point is $\pm 5\%$ from the set point for 45 seconds then issue a FEEDBACK FAILURE alarm.
FORCE OVERRIDE: A failure condition occurs that requires the control logic to override a calculated value used for controlling a device such as valve position or pump speed, etc.
NO STANDBY AVAILABLE: The control strategy has a 'duty' and 'standby' service operation under AUTO mode and there is only one pump available for AUTO control then issue a NO STANDBY AVAILABLE warning.
TRACKING FAILURE: A variable speed device or modulating valve is commanded to a speed or position percentage and the feedback from the drive tachometer or actuator positioner is $\pm 5\%$ from the commanded speed or position for 45 seconds then issue a TRACKING FAILURE alarm.
POWER OUTAGE FORCED STOP: The equipment was running under the PCS control in MANUAL mode prior to loss of power and due to the power outage, the equipment was stopped. Issue a POWER OUTAGE FORCED STOP alarm upon this condition.

In addition, alarm priority levels are assigned a number from 1 to 4. The numbers are categorized by the urgency of the alarm condition and are as follows:

PRIORITY	DESCRIPTION
1	Human safety in Danger/Chemical Spill Potential/Toxic Gas Leak.
2	Equipment or system failure; or interlock to shutdown equipment to prevent mechanical damage.
3	Control override to prevent jeopardizing process performance or possible mechanical damage.
4	Warning of potential problem effecting process performance or possible mechanical damage.

7. Fault Mode: This section provides the functional control requirements in the event that there is an equipment or instrument failure. An equipment failure is defined as the inability to control or monitor a device placed under REMOTE control due to an alarm condition. An instrument failure is defined as the inability to monitor a device due to an alarm condition.

8. **Interface:** This section provides a description of the physical electrical connection for the loop input/output signal. This section is for reference only. The actual physical connection is to be field verified.
9. **Power Outage:** This section provides functional control requirements in the event of a loss of power and the functional control requirements upon power restoration.

B. General Function:

1. All values shown in Control Strategies are to be adjustable. The values shown are only initial values and are to be tuned during startup. All values inputted become default values and remain until changed by the operator. Each successive time the strategy is initiated the default values are used and no values are required to be inputted by the operator unless the operator chooses a value change.
2. During process start-up, inhibit alarms required for the Control Strategies that cause a nuisance alarm. Once the equipment is operating all alarms are available in the event of a failure. All logic generated process alarms such as low pressure, high turbidity, low low level, etc. are to be provided with separate adjustable delay timers to prevent nuisance alarms from occurring during equipment start-up, equipment shutdown or a process spike.

C. Project Overview:

1. The reclaimed water treatment plant (Project 4A) is designed to produce 4.0 million gallons per day (MGD) of stormwater. The plant includes a covered storage for raw surface water and stormwater, pretreatment consisting of coagulation and flocculation, sedimentation, filtration and disinfection, as well as finished water storage. Contract drawings show the overall project components including the locations of the storm and surface water sources.

TABLE 1: CONTROL STRATEGY NO. REFERENCED BY CONTROL STRATEGY (Refer to Section 13500 for detailed descriptions of each Control strategy)	
Control Strategy #	Title
01	Flow Equalization Basin
02	Fine Screens
03	BioReactors (Plants 2, 3)
04	Blowers
05	MBR Systems
06	RAS Pumps
07	WAS Pumps
08	IR Pumps

2.09 Existing SCADA Software modifications:

A. Products and Manufacturers: City of Sanibel currently uses the following SCADA/ HMI software:

1. Wonderware

Existing graphical screens are attached as supplement E to this specification. Integrator is expected to match the format of the screens for conformance and standardization purposes.

2. The SCADA/ HMI Software system shall be modified to provide access to the proposed system elements that allow direct operations personnel interface to documentation, process management information, process control blocks, and system configuration elements.

3. The modifications to the existing software packages and subsystems shall allow operations personnel access to manipulate and monitor control blocks and operations environment. Tasks allocated to systems and process engineers and process operators shall be simplified for easy use.

4. Existing Software is comprised of the following:

- a. System configuration utilities.
- b. Database manager.
- c. Environment configuration utilities.
- d. Graphic screen painter.
- e. Graphic screen viewer.
- f. Historical data manager.
- g. Reporting system.
- h. Real-time data manager.
- i. Communications subsystem.
- j. Alarm handler.
- k. Supervisory control system.

5. All modifications to add the proposed equipment to the existing System software shall work as virtually independent units or in concert with other internal software. Human interface software shall support operations such as:

- a. Setting up I/O database.
 - b. Accessing I/O point settings.
 - c. Editing graphic displays and building new displays.
 - d. Editing and creating objects within displays.
 - e. Editing system configuration.
 - f. Setting up and tracking process control trends.
 - g. Checking system performance.
6. Modifications performed to add all proposed equipment to the existing SCADA/HMI software shall provide standard process control algorithms for use with control schemes as shown and specified in this Section, and to enable operations personnel to develop new supervisory and regulatory distributed digital, control schemes on-line. Provide algorithms consisting of modular, function block type of control elements which are familiar to control engineers. Algorithms shall include input blocks for acquiring, converting, and characterizing signals representing process variables; computational blocks for performing arithmetic, scaling, and compensating operations; control blocks for performing control functions; and special algorithm blocks for switching, fan-out, display, and user-specified operations, including interacting with supervisory programs. Tuning constants shall be easily set from operator consoles and workstation keyboards.
7. Graphical user interface shall support distributed access through the alarm and historical modules as well as application development and transfer across a network with built-in network application development (NAD) functionality. NAD shall provide automatic notification of application changes and automatic distribution of updated applications to runtime (view) nodes.
8. Graphical user interface shall be capable of exporting entire database of I/O points into CSV file format for import and subsequent editing to a Microsoft Excel spreadsheet.
9. Electronic Documentation:
- a. Documentation for control system shall be provided with the system in electronic format. Documentation shall be available and accessible from within the applications programs.
 - b. Documentation shall be broken down by function. Information usually required for an authorized person to perform configuration shall be

included in a guide; information required to configure the process I/O blocks shall be included in control blocks documents.

i. Online Help:

- a) Online help shall provide information and assistance to user as user uses an application program. Information available through online help shall relate to the current display, current program operation or selection, and changes as user proceeds through the program to provide user with appropriate information.
- b) Help shall be requested by selecting "HELP" from the menu bar. Menu of topics relating to current display or selection shall appear on the screen. Help text shall be displayed in a partial screen overlay.
- c) Screen control functions shall be displayed as menu selections.

10. Real- Time Displays:

- a. Add new graphic screens using existing drawing package. Use of proprietary graphic file formats is unacceptable. The Integrator shall ensure to keep the format of the graphic screens similar to the existing graphic screens.
- b. Proposed system graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, and links to other graphic screens.
- c. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.
- d. Graphics editor shall allow layering of objects to activate specific objects based upon specific conditions in control system.
- e. Graphics editor tool shall allow object placement via "snap-to-grid" feature with configurable grid spacing. The operator has the ability to configure the pixel interval on the "snap-to-grid" tool.
- f. System shall support import of DXF files with the drawing elements imported as native objects. It shall be possible to animate such objects using a full set of object animation properties.
- g. User shall be able to configure graphic screens while system is monitoring the process.

11. System Configuration:
 - a. At minimum, graphical user interface shall allow user to perform the following tasks with proper password access.
 - i. Create, delete, or edit control strategies.
 - ii. Add and delete objects to the system.
 - iii. Tune control loops through editing of control loop parameters.
 - iv. Enable and disable control strategies.
 - v. Select points to be alarmed and define the alarm status.
 - vi. Select points to be trended over a period of time and initiate recording of values automatically.
12. Integrator shall develop the new graphical screens of the proposed system and submit for Engineer/ Owner's review a draft and a final graphical screens of the proposed system that are required to be added to the existing SCADA/ HMI system.
13. At a minimum two meetings shall be required for review of the proposed graphical screens with the Engineer/ Owner. Integrator shall accommodate/ allocate time to allow for graphical screen changes/ corrections. All changes/ corrections shall be recorded and submitted for Engineer/ Owner's approval upon which the Integrator shall coordinate for onsite deployment.
14. Alarm Subsystem:
 - a. Provide system with alarm window or console. Window shall notify user of alarm conditions and allow user to view details of alarm and acknowledge the alarm.
 - b. When alarm console is not visible, separate alarm notification window will supersede other windows on the display and shall not be capable of being minimized by user. This window will notify user of new alarms and unacknowledged alarms. Alarm notification windows or banners that can be minimized by the user are unacceptable.
 - c. User shall be able to select alarms displayed by object alarms by group and priority by using command buttons. Up to 98 priority levels shall be supported. User shall able to view and acknowledge alarms from any node in the enterprise.
 - d. Alarms shall be color-coded according to alarm status and priority, including an acknowledged alarm, unacknowledged alarm, and alarm that has returned to normal but is not yet acknowledged.

- e. System shall be configurable such that the user is notified of alarm no matter what display the user is currently viewing. Notification shall include the option of pop-up alarm display window, flashing symbol, alarm text message that is available on each display, or dedicated alarm display window on the screen.
- f. User shall be able to view alarms on individual or a group basis, with support for 16 groups each having up to 16 sub-groups. Alarm hierarchy shall be capable of being nested up to eight levels deep.
- g. Provide capability of performing alarm acknowledgment on all alarms, on alarms in a single group, and on alarms in collection of groups as defined in an alarm group hierarchy, or on a point-by-point basis.
- h. Provide system capable of storing alarms in structured query language (SQL) database for long term storage of alarm information.
- i. Standard alarm display shall support display of the following alarm parameters which are user-selectable in the configuration mode:
 - i. Date
 - ii. Time
 - iii. Event
 - iv. Alarm type
 - v. Operator
 - vi. Priority
 - vii. Comment
 - viii. Tag name
 - ix. Group name
 - x. Value of variable in alarm
 - xi. Alarm limit
 - xii. Alarm status

15. Process Report Generation:

- a. Process report generation software shall provide means to process, store, and print data for historical records by utilizing dynamic data exchange (DDE) incorporated in Microsoft Windows operating system.

- b. Software shall be flexible so that contents of reports can be easily modified.
- c. Software shall provide for collecting, processing, and storing values for minimum of 800 database points.
- d. Provide the following minimum data collection functions:
 - i. Instantaneous value; value at end of data collection interval.
 - ii. Average value during time interval.
 - iii. Totalization over time interval.
 - iv. Highest value over time interval.
 - v. Lowest value over time interval.
 - vi. Where “indicating light” on/off is indicated, provide run time counter for each device.
- e. At maximum, data shall be collected at ten-minute intervals.
- f. Provide capability for data values to be manually input by the user. Also provide capability for the user to flag any data field.
- g. Each log report page shall have the capability to contain information for ten log points, minimum.
- h. Periodic log reports shall be printed automatically at end of time period.
- i. Provide calculation extension capability to perform calculations on data that has been accumulated for report generation. Calculations shall consist of addition, subtraction, multiplication, and division functions for calculations of such items as engineering unit changes, totalization values where measurement values are different, and performance indexes. Include provisions for minimum of fifty calculation extensions.
- j. Reports shall be free-form, thereby printing all general information, headings, and data in established format at time of generation. Preprinted sheets are unacceptable. Each report page shall include facility name, type of report, date and time the report was printed, and page numbers.
- k. Provide software for generating special event, hourly, daily, monthly and annual reports. Reports shall be generated using process input/output, event information, and manual or computed point information from records in database.

- l. Historical data display should allow the user to zoom in and out in time from one second to up to six weeks in one display. Provide capability to activate zoom-in and zoom-out features using action scripted command buttons available to the user. System shall allow user to pan backward and forward in time through historically logged data.
- m. Provide capability for user to print historically trended information in form of printed record. Historically-collected data shall be available for export to spreadsheet for analysis, additional reports, and other manipulation.

2.10 SOURCE QUALITY CONTROL

A. General:

1. Factory Test:

- a. Representatives of OWNER and/or ENGINEER will witness factory test at testing facility during operational test of equipment, either for individual units or as an integrated system. Give minimum of 30 days notice to ENGINEER prior to the proposed testing date so that arrangements for test witnessing can be made. Presence of OWNER and ENGINEER during testing does not relieve CONTRACTOR from complying with the Contract Documents and shall not imply acceptance of equipment. When factory tests have been successfully completed, a submit factory test report to ENGINEER.
- 2. Factory test results will be acceptable when all components within tested control panel or system being tested successfully operate and meet its intended function, and are so certified by the testing entity.
- 3. Do not ship the equipment until obtaining ENGINEER's acceptance of factory test results.

B. Factory Inspection:

- 1. Inspect each panel, console, device, and cabinet before testing and before shipping. Inspection shall include, but not be limited to the following:
 - a. Verify all "Approved as Corrected" comments on Shop Drawings were implemented.
 - b. Verify presence of and accuracy of nameplates and tags.
 - c. Verify that wire sizes and color-coding comply with the Contract Documents.

- d. Verify presence of terminal blocks, terminal block numbers, and required quantity of spares.
- e. Verify annunciator window engravings and quantity of spare windows comply with the Contract Documents.
- f. Verify proper wiring practices and grounding.
- g. Verify enclosure flatness, finish, and color.
- h. Verify anchoring of wire bundles between subpanels and front panel-mounted devices.
- i. Verify presence of applicable items specified in this Section.
- j. Check and verify software licenses for latest release and license types.

C. Panel Operational Testing:

- 1. Test all input/output components to verify that internal panel wiring is properly terminated at correct locations. Verify initial ranges and settings.
- 2. Test all system hardware and software to verify proper operation as stand-alone units. Test shall include, but not be limited to, the following:
 - a. Power distribution and breaker ratings to match approved Shop Drawings.
 - b. Power fail/restart tests.
 - c. Diagnostics checks.
 - d. Demonstrate that all specified equipment functional capabilities are working properly.
 - e. Check and verify process displays are in accordance with approved Shop Drawings.
- 3. Test components and devices requiring data transmission to verify that communication between such components is working properly. Verify communication by using the same media required for the completed system at the Site as indicated in the Contract Documents.
- 4. Perform integrated system test with all system equipment and simulated inputs/outputs connected to verify that equipment is performing properly as an integrated system.
- 5. Simulation devices shall be of suitable quality to not mask control panel defects.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine conditions under which the Work will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Environmental Requirements:

- 1. Do not install instruments in areas where construction may cause instrument to be damaged, without providing adequate protection for said instrument.

- B. Installation of Instrumentation:

- 1. Secure field-mounted instruments to stands or brackets in accordance with manufacturer's recommendations, approved or accepted (as applicable) submittals, and the Contract Documents.
 - 2. Locate sensors where shown on the Drawings. Confirm exact locations in the field with ENGINEER.
 - 3. Install all devices so that devices are readily accessible for service and do not cause potential hazards.

- C. Installation of Fiber Optic Cable

- 1. Provide continuous inter- and intra-building installation, closet to closet, suitable for passing through inside conduit locations directly from outside conduit. Exempt from NFPS 70 (NEC) Article 770-50 (50-foot rule).
 - 2. Fiber optic cable installation shall include the following:
 - a. Do not exceed cable minimum bend radius. Tight loops, kinks, knots, and tight bends during and after installation are unacceptable.
 - b. Pull cables using an indirect attachment method such as Kellems Grip to distribute the pulling forces over cable's outer portion. Pulls directly on fiber core are not allowed.
 - c. Provide handholds and pull boxes as required by cable manufacturer. At minimum, provide handholds or pull boxes minimum of every two hundred feet, and at every third 90-degree conduit bend.
 - d. Upon receipt of the fiber optic cable reels, test each fiber separately with optical time domain reflectometer (OTDR) to verify fiber length,

attenuation and continuity. Maximum total loss including connectors and cable attenuation for each fiber optic link shall not exceed 7.5 dB.

D. Services and Operator Instructions:

1. Provide repairs or replacement of defective materials, equipment or workmanship, including with respect to equipment, the services of factory-trained servicemen.
2. In addition to the calibration required for check-out, provide two additional calibrations on all instruments. The first re-calibration shall be approximately six months after acceptance of the system, and the second shall be approximately eleven months after acceptance. As part of each calibration, provide two copies of the calibration sheets, a detailed list of deficiencies (should any be found), and a statement that the entire system is in proper operation and condition (except for the deficiencies noted) and shall be turned over to the OWNER.

3.03 FIELD QUALITY CONTROL

A. Tests and Inspections: Field-verify calibration and performance of each instrument prior to start-up of the associated equipment, and document on a separate sheet for each.

1. For each calibration certification sheet, include the following information:
 - a. Project name.
 - b. Tag number and description.
 - c. Manufacturer.
 - d. Model and serial number.
 - e. Date, time and person who performed calibration.
 - f. Calibration data to include.
 - 1) Input, output, and error at 0, 25, 75, and 100 percent of span for analog instruments.
 - 2) Switch setting, contact action and deadband, if applicable, for discrete elements.
 - g. Space for comments.
 - h. Signature and date.
2. System Check-Out and Start-Up Responsibilities:

- a. CONTRACTOR shall retain the services of the System Supplier to supervise and/or perform check-out and start-up of all system components. As part of these services, the System Supplier shall include for those equipment items not manufactured by him the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.
- b. Check and approve the installation of all instrumentation and control system components and all cable and wiring connections between the various system components prior to placing the various processes and equipment into operation.
- c. Conduct a complete system checkout and adjustment, including calibration of all instruments, tuning of control loops, checking operation functions, and testing of final control actions. When there are future operational functions included in the Work, they should be included in the system checkout. All problems encountered shall be promptly corrected to prevent any delays in start-up of the various unit processes.
- d. CONTRACTOR shall provide all test equipment necessary to perform the testing during system checkout and start-up.
- e. CONTRACTOR and System Supplier shall be responsible for initial operation of monitoring and control system and shall make any required changes, adjustments or replacements for operation, monitoring and control of the various processes and equipment necessary to perform the functions intended at no additional cost to the OWNER. These changes or adjustments shall be documented by the CONTRACTOR and submitted to the ENGINEER as part of the Installation Inspection Report described in Paragraph g. below.
- f. CONTRACTOR shall furnish to the ENGINEER certified calibration reports for field instruments and panel mounted devices specified in this Section as soon as calibration is completed.
- g. CONTRACTOR shall furnish ENGINEER an Installation Inspection Report certifying that all equipment has been installed correctly and is operating properly. The report shall be signed by authorized representatives of both CONTRACTOR and the System Supplier.
- h. Instrumentation and Control System Field Test:
 - i. Following the instrumentation and control system checkout and initial operation, CONTRACTOR, under the supervision of the System Supplier, shall perform a complete system test to verify that all equipment and programmed software is operating

properly as a fully integrated system, and that the intended instrumentation and control functions are fully implemented and operational. Any defects or problems found during the test shall be corrected by CONTRACTOR and then retested to demonstrate proper operation.

- ii. Following demonstration of all system functions, the instrumentation and control system, including field sensors/transducers and instruments, and telemetry system shall be running and fully operational for a continuous 48 hour period.

3.04 MANUFACTURER'S SERVICES

A. General:

1. CONTRACTOR shall retain the services of the System Supplier to provide operation and maintenance training for all instrumentation and control system equipment as specified herein.
2. For equipment items not manufactured by the System Supplier, he shall provide for on-Site training by an authorized representative of the equipment manufacturer as part of his services. The manufacturer's representative shall be fully knowledgeable in the operation and maintenance of the equipment.
3. CONTRACTOR shall be responsible for all costs associated with training and shall provide all required materials, texts and required supplies.
4. Training shall conform to the requirements of Section 01730, Operating and Maintenance Data.

B. On-Site Training:

1. General:

- a. Provide on-Site operation and maintenance training by System Supplier and the equipment manufacturer representatives prior to placing the equipment in continuous operation.
- b. Training courses shall include time for students to develop and demonstrate understanding of training concepts. Testing shall include hands on training with equipment.
- c. At the conclusion of each course students shall be tested on course material. Testing shall include exercises where students must demonstrate proper response to normal operational needs, emergencies and maintenance tasks. Every student shall be tested individually.

- d. Training shall accomplish the following:
 - i. Provide instruction covering use and operation of the equipment to perform the intended functions.
 - ii. Provide instruction covering procedures for routine, preventive and troubleshooting maintenance, including equipment calibration.
 - iii. Explain procedures for placing the equipment in and out of operation and explain necessary actions and precautions to be taken regarding the overall plant monitoring and control system.
 - iv. Provide classes and field training as to how to change process control and alarm set points in all microprocessor based controllers and transmitters. Maintenance personnel shall be trained to enter passwords, programming or configuration data, etc.

2. Primary Sensors/Transducers and Field Instruments:

- a. The services of equipment manufacturer's representatives shall be provided for a minimum of 2 hours for each type of instrument.
- b. Training shall include:
 - i. Basic repair and maintenance capabilities of installed equipment.
 - ii. Procedures for placing the equipment in and out of operation.
 - iii. Use of any special repair equipment or software packages that are used for repair or maintenance.
 - iv. Procedures for testing any repair before placing equipment back in service.

3. PLC and OIT Training

- a. Training shall include
 - i. Hardware and software configuration of PLC and OIT programs.
 - ii. Perform a walk through with students identifying system components. Instructor shall test each student's knowledge of system components during walk through.
 - iii. Identify key operating and alarm features of the project specific PLC and HMI programs.

- iv. Test students knowledge of proper response to alarms, capabilities to replace hardware components, switch hardware and software between online and offline, add new components, know when to call for assistance, demonstrate understanding of hardware and safety requirements, understand impact of changes made to rest of the control system.
- v. Provide instruction covering basic editing of PLC programs and OIT screens. Instruction shall include testing students programming capabilities by having students make minor changes to programs and test changes online.

END OF SECTION

SECTION 13420

13420 FIELD INSTRUMENT SCHEDULE

Instrument Description	Tag	Type	Units	Range	Setpoint	Size	Manufacturer	Model Number	Transmitter #	Power Supply	Output	Sheet #	Notes
IR PUMP NO. 6 FLOW RATE	FE/FIT-4656	MAGNETIC	MGD	0-2.016	-	8-INCH	Siemens	Mag 5000	Sitrans 5000	120 VAC	4-20 mA	I-2001	Ebonite Liner, Hastelloy C-276 Electrodes, Nema 4X
IR PUMP NO. 7 FLOW RATE	FE/FIT-4657	MAGNETIC	MGD	0-2.016	-	8-INCH	Siemens	Mag 5000	Sitrans 5000	120 VAC	4-20 mA	I-2001	Ebonite Liner, Hastelloy C-276 Electrodes, Nema 4X
EFFLUENT FLOW RATE	FE/FIT-XX	MAGNETIC	MGD	0-6	-	24-INCH	Siemens	Mag 5000	Sitrans 5000	120 VAC	4-20 mA	I-2002	Ebonite Liner, Hastelloy C-276 Electrodes, Nema 4X
SUPPLEMENTAL CARBON TANK LEVEL TRANSMITTER	LE/LIT-5001	ULTRASONIC	FT	1-6	-	-	Siemens	Echomax XRS-5	LT500	120 VAC	4-20 mA	I-2002	
SUPPLEMENTAL CARBON TANK LEVEL HIGH SWITCH	LSH-5001	VIBRATING POINT	-	-	SEE NOTES	1/2-INCH	Siemens	LVL200	N/A	120 VAC	Form C	I-2002	Coordinate fork length with tank manufacturer
SUPPLEMENTAL CARBON LEAK	LS-5001	VIBRATING POINT	-	-	SEE NOTES	1/2-INCH	Siemens	LVL100	N/A	120 VAC	Form C	I-2002	Coordinate fork length with tank manufacturer

General Notes

- PROCESS FLUID: WASTEWATER, TEMP - 30 -100 DEG F
1. ALL WETTED PARTS SHALL BE COMPATIBLE WITH THE PROCESS FLUID AND NSF 61 CERTIFIED WHEN REQUIRED.
 2. INSTALL ALL INSTRUMENT PER MANUFACTURES RECOMMENDATIONS AND INSTALLATION DETAILS PER CONTRACT DRAWINGS.
 3. FACTORY CALIBRATE ALL INSTRUMENTS PRIOR TO SHIPPING TO PROJECT SITE. IN ADDITION TO FACTORY CALIBRATION ALL PROCESS PROBES REQUIRE CORRELATION/MATRIX CORRECTION TO ACTUAL FIELD CONDITIONS.
 4. PROVIDE REMOTE TRANSMITTERS / DISPLAYS FOR ALL INSTRUMENTS LOCATED HIGHER THAN 5 FEET FROM FINISHED FLOOR OR GRADE.
 5. INSTRUMENT SPECIFIC NOTES APPLICABLE TO ALL SIMILAR INSTRUMENTS.

SECTION 13425

I/O TABLE

NO	SHEET #	DESCRIPTION	TAG	TYPE	SIGNAL	RANGE / OFF STATUS	UNITS / ON STATUS	FIELD WIRING DATA		NOTES
								FIELD ISA SIGNAL SOURCE / DESIGNATION	CONTROL PANEL	
1	I-2001									
		IR PUMP NO.6 RESET	HS-4656	DO	HARDWIRE	-	RESET	VFD-4656	PLC-4	
		IR PUMP NO.6 NOT IN REMOTE	HA-4656	DI	HARDWIRE	ALARM	IN REMOTE	VFD-4656	PLC-4	
		IR PUMP NO.6 START/STOP COMMAND	YC-4656	DO	HARDWIRE	START	STOP	VFD-4656	PLC-4	
		IR PUMP NO.6 RUNNING	YIR-4656	DI	HARDWIRE	RUNNING	-	VFD-4656	PLC-4	
		IR PUMP NO.6 SPEED COMMAND	SCR-4656	AO	HARDWIRE	0-60	HZ	VFD-4656	PLC-4	
		IR PUMP NO.6 SPEED FEEDBACK	SIR-4656	AI	HARDWIRE	0-60	HZ	VFD-4656	PLC-4	
		IR PUMP NO.6 DRIVE FAULT	YA-4656	DI	HARDWIRE	NORMAL	ALARM	VFD-4656	PLC-4	
		IR PUMP NO.6 HIGH MOTOR TEMPERATURE	THA-4656	DI	HARDWIRE	NORMAL	ALARM	TSH-4656	PLC-4	
		IR PUMP NO.6 MOISTURE	MHA-4656	DI	HARDWIRE	NORMAL	ALARM	MS-4656	PLC-4	
		IR PUMP NO.6 FLOW RATE	FIR-4656	AI	HARDWIRE	X-XX	GPM	FE/FIT-4656	PLC-4	
		IR PUMP NO.7 RESET	HS-4657	DO	HARDWIRE	-	RESET	VFD-4657	PLC-4	
		IR PUMP NO.7 NOT IN REMOTE	HA-4657	DI	HARDWIRE	ALARM	IN REMOTE	VFD-4657	PLC-4	
		IR PUMP NO.7 START/STOP COMMAND	YC-4657	DO	HARDWIRE	START	STOP	VFD-4657	PLC-4	
		IR PUMP NO.7 RUNNING	YIR-4657	DI	HARDWIRE	RUNNING	-	VFD-4657	PLC-4	
		IR PUMP NO.7 SPEED COMMAND	SCR-4657	AO	HARDWIRE	0-60	HZ	VFD-4657	PLC-4	
		IR PUMP NO.7 SPEED FEEDBACK	SIR-4657	AI	HARDWIRE	0-60	HZ	VFD-4657	PLC-4	
		IR PUMP NO.7 DRIVE FAULT	YA-4657	DI	HARDWIRE	NORMAL	ALARM	VFD-4657	PLC-4	
		IR PUMP NO.7 HIGH MOTOR TEMPERATURE	THA-4657	DI	HARDWIRE	NORMAL	ALARM	TSH-4657	PLC-4	
		IR PUMP NO.7 MOISTURE	MHA-4657	DI	HARDWIRE	NORMAL	ALARM	MS-4657	PLC-4	
		IR PUMP NO. 7 FLOW RATE	FIR-4657	AI	HARDWIRE	X-XX	GPM	FE/FIT-4657	PLC-4	
	I-2002									
		EFFLUENT FLOW METER	FIR-XX	AI	HARDWIRE	X-XX	GPM	FE/FIT-XXX	PLC-4	
		SUPPLEMENTAL CARBON TANK LEVEL	LIR-5001	AI	HARDWIRE	X-XX	FEET	FILL PANEL	PLC-4	
		SUPPLEMENTAL CARBON LEVEL HIGH SWITCH	LHA-5001	DI	HARDWIRE	-	ALARM	FILL PANEL	PLC-4	
		SUPPLEMENTAL CARBON LEAK DETECTED	LA-5001	DI	HARDWIRE	NORMAL	ALARM	FILL PANEL	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.1 NOT IN REMOTE	HA-5010	DI	HARDWIRE	ALARM	IN REMOTE	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.1 START COMMAND	YC-5010	DO	HARDWIRE	STOP	START	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.1 RUNNING	YIR-5010	DI	HARDWIRE	RUNNING	-	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.1 SPEED COMMAND	SCR-5010	AO	HARDWIRE	0-100	%	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.1 SPEED COMMAND FEEDBACK	SIR-5010	AI	HARDWIRE	0-100	%	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.1 HIGH DISCHARGE PRESSURE	PHA-5010	DI	HARDWIRE	NORMAL	ALARM	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.2 NOT IN REMOTE	HA-5020	DI	HARDWIRE	ALARM	IN REMOTE	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.2 START COMMAND	YC-5020	DO	HARDWIRE	STOP	START	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.2 RUNNING	YIR-5020	DI	HARDWIRE	RUNNING	-	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.2 SPEED COMMAND	SCR-5020	AO	HARDWIRE	0-100	%	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.2 SPEED COMMAND FEEDBACK	SIR-5020	AI	HARDWIRE	0-100	%	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.2 HIGH DISCHARGE PRESSURE	PHA-5020	DI	HARDWIRE	NORMAL	ALARM	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.3 NOT IN REMOTE	HA-5030	DI	HARDWIRE	ALARM	IN REMOTE	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.3 START COMMAND	YC-5030	DO	HARDWIRE	STOP	START	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.3 RUNNING	YIR-5030	DI	HARDWIRE	RUNNING	-	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.3 SPEED COMMAND	SCR-5030	AO	HARDWIRE	0-100	%	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.3 SPEED COMMAND FEEDBACK	SIR-5030	AI	HARDWIRE	0-100	%	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		SUPPLEMENTAL CARBON METERING PUMP NO.3 HIGH DISCHARGE PRESSURE	PHA-5030	DI	HARDWIRE	NORMAL	ALARM	SUPPLEMENTAL CARBON METERING SKID	PLC-4	
		TRIPLEX METERING PUMP SKID LEAK	LA-5010	DI	HARDWIRE	NORMAL	ALARM	SUPPLEMENTAL CARBON METERING SKID	PLC-4	

END

SECTION 13470

PROCESS CONTROL NARRATIVE

PART 1 - GENERAL

1.01 PURPOSE

- A. This document describes the process automation for the City of Sanibel Donax WRF. This document along with the P&ID's and I/O list will give the PLC programmer an understanding of the control systems pertinent to the project.

1.02 IR PUMPS

- A. The operator will enter desired IR flow rate for each IR pump.
- B. The PLC will target IR flow for each pump.
- C. The IR pumps will shut down on high temp and moisture detection.

1.03 EQUIPMENT AND DEVICES

- A. The following field devices and equipment are used in the IR pumps (IR Pump No.6 as example, No.7 typ):

1.04 WELL PUMP CONTROL

- A. LOCAL:
 - 1. When the Field LOR switch (mounted at VFD) is in LOCAL, the associated pump can be controlled.
 - 2. When the Field LOR switch is in OFF, the associated pump will stop, and all REMOTE control will be disabled.
 - 3. When the Field LOR switch is in REMOTE, the associated pump will be controlled by the PLC and HMI as described below.
- B. REMOTE HAND:
 - 1. Hand is Selected from the HMI; the pump will run.
 - 2. Operator can manually set the speed output of the pump.
- C. REMOTE AUTO:
 - 1. Auto is selected from the HMI, the associated pump(s) will operate via PLC control below:

2. The PLC shall start the pump and adjust the speed until the Operator flowrate setpoint is achieved.

1.05 PARAMETER AND DISPLAY ON HMI

Parameters on HMI				
Description	Parameter	Units	Scale	Setpoint
IR Pump No.6 Target Flow Rate	Adjustable	GPM	0-XXX	XXX
IR Pump No.7 Target Flow Rate	Adjustable	GPM	0-XXX	XXX

Display on PLC			
Description	Parameter	Units	Scale
IR Pump No.6 Flow		GPM	
IR Pump No.7 Flow		GPM	
Pump Mode Indication	Local/Remote*		
Pump Mode Indication	Remote Hand/Remote Auto*		
Pump Status	Running / Stopped*		
Pump Status	Speed Indication*		
Flow PID Control Variable	Status Display	%	0-100
Flow PID Derivative Parameter	Status Display		
Flow PID Integral Parameter	Status Display		
Flow PID Proportional Parameter	Status Display		
* Typical for each pump			

1.06 ALARMS

Alarms			
Tag	Function	Action	Interlock
EA-4656	IR Pump No.6 Not in Remote	Warning	
MHA-4656	IR Pump No.6 Moisture	Alarm	Shutdown via Drive
YA-4656	IR Pump No.6 VFD Fault	Alarm	Shutdown via Drive
THA-4656	IR Pump No.6 High Temp	Alarm	Shutdown via Drive
	IR Pump No.7 Typ		

1.10 INTERLOCKS

- A. N/A

1.11 SUPPLEMENTAL CARBON

- A. Automatically run when treatment plant is online.
- B. Manual dose entered into PLC.

- C. PLC will automatically flow pace dose based on treatment basin flow rate.

1.12 CONTROL

- A. Metering Pumps (50-CMP-10 and 50-CMP-30)
- B. Metering Pump (50-CMP-20) assignable spare.

1.13 LOCAL

- A. When the Field LOR switch is in LOCAL, the associated pump can be controlled with local push buttons and stroke adjustment.
- B. When the Field LOR switch is in OFF, the associated pump will stop, and all REMOTE control will be disabled.
- C. When the Field LOR switch is in REMOTE, the associated pump will be controlled by the PLC and HMI as described below.

1.14 REMOTE HAND:

- A. If the associated pump is in Field Remote, and Hand is Selected from SCADA or the HMI, the pump will run at an Operator selected speed.

1.15 REMOTE OFF:

- A. If the associated pump is in Field Remote, and Off is selected from SCADA or the HMI, the pump will stop if running and will remain off.

1.16 REMOTE AUTO:

- A. If the associated pump is in Field Remote, and Auto is selected from SCADA or the HMI, the associated pump(s) will operate via PLC control below:
- B. The desired Dose must be entered by the Operator from SCADA or HMI.
- C. The PLC will initialize a flow controller for the associated pump.
- D. The flow controller will calculate the proper flow rate based on the operator selected Dose
- E. $\text{Flowrate (mgd)} \times \text{Dose (mg/L)} \times 0.3475 / (\text{S.G}) = \text{Flowrate (gph, as product)}$

1.17 PARAMETER AND DISPLAY ON PLC

Parameters on PLC				
Description	Parameter	Units	Scale	Setpoint
Plant No.2 Supplemental Carbon Dose	Adjustable	Mg/L	0-XX	XX
Plant No.3 Supplemental Carbon Dose	Adjustable	Mg/L	0-XX	XX

Display on PLC			
Description	Parameter	Units	Scale
Plant No.2 Flow Rate		GPM	0-XXX
Plant No.3 Flow Rate			
Metering Pump Status	Hand/Off/Auto		
Metering Pump Status	Available / Not Available		
Metering Pump Status	Running / Stopped		
Metering Pump Status	Speed Indication		

1.18 ALARMS

Alarms			
Tag	Function	Action	Notes
EA-5010	Supplemental Carbon Pump No.1 Not in Remote	Alarm	
YA-5010	Supplemental Carbon Pump No.1 Fault	Alarm	
PHA-5010	Supplemental Carbon Pump No.1 High Discharge Pressure	Warning	
EA-5030	Supplemental Carbon Pump No.2 Not in Remote	Alarm	
YA-3050	Supplemental Carbon Pump No.2 Fault	Alarm	
PHA-5030	Supplemental Carbon Pump No.2 High Discharge Pressure	Warning	

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION



DIVISION 15

MECHANICAL

SECTION 15000

MECHANICAL - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. All equipment furnished and installed under this contract shall conform to the general stipulations set forth in this Section except as otherwise specified in other Sections.
2. Contractor shall coordinate all details of equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alternations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.

B. Related Work Described Elsewhere: Other Sections directly referenced in this section include the following:

1. General Requirements: Division 1.
2. Concrete: Division 3.
3. Finishes: Division 9.
4. Equipment: Division 11.

C. Contract Drawings and Specifications: The Contract Drawings and Specifications shall be considered as complementary, one to the other, so that materials and work indicated, called for, or implied by the one and not by the other shall be supplied and installed as though specifically called for by both. The Contract Drawings are to be considered diagrammatic, not necessarily showing in detail or to scale all of the equipment or minor items. In the event of discrepancies between the Contract Drawings and Specifications, or between either of these and any regulations or ordinances governing work of these Specifications, the bidder shall notify the Engineer in ample time to permit revisions.

1.02 QUALITY ASSURANCE

- A. **Materials and Equipment:** Unless otherwise specified, all materials and equipment furnished for permanent installation in the Work shall conform to applicable standards and specifications and shall be new, unused, and undamaged when installed or otherwise incorporated in the Work. No such material or equipment shall be used by the Contractor for any purpose other than that intended or specified, unless such use is specifically authorized in writing by the Owner. No material shall be delivered to the site without prior acceptance of drawings and data by the Engineer.
- B. **Equivalent Materials and Equipment:**
 - 1. Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specific item mentioned shall be understood as establishing the type, function, and quality desired. Other manufacturers' products will be accepted provided sufficient information is submitted to allow the Engineer to determine that the products proposed are equivalent to those named. Such items shall be submitted for review in accordance with Section 01340: Shop Drawings and Submittals.
 - 2. Requests for review of equivalency will not be accepted from anyone except the Contractor and such requests will not be considered until after the contract has been awarded.
- C. **Governing Standards:** Equipment and appurtenances shall be designed in conformity with ANSI, ASME, ASTM, IEEE, NEMA, OSHA, AGMA, and other generally accepted applicable standards. They shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation, and all conditions of operations. All bearings and moving parts shall be adequately protected against wear by bushings or other acceptable means. Provisions shall be made for adequate lubrication with readily accessible means.
- D. **Tolerances:** Machinery parts shall conform to the dimensions indicated on the Drawings within allowable tolerances. Protruding members such as joints, corners, and gear covers shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structural shapes shall be rounded or chamfered.
- E. **Clearances:** Ample clearances shall be provided for inspection and adjustment. All equipment shall fit the allotted space and shall leave reasonable access room for servicing and repairs. Greater space and room required by substituted equipment shall be provided by the Contractor and at his expense.

F. Testing:

1. When the equipment is specified to be factory tested, the results of the tests shall be submitted to the Engineer and approval of the test results shall be obtained before shipment of the equipment.
2. When an item of equipment, including controls and instrumentation, has been completely erected, the Contractor shall notify the Engineer, who will designate a time to make such tests as required, and operate the item to the satisfaction of the Engineer. All testing shall be done in the presence of the Engineer. "Completely erected" shall mean that the installation is erected, all necessary adjustments have been made, all required utility connections have been made, required lubricants and hydraulic fluid have been added and the unit has been cleaned and painted.

G. Failure of Test:

1. Defects: Any defects in the equipment, or deviations from the guarantees or requirements of the Specifications, shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to correct any defects or deviations, or if the replaced equipment when tested shall fail again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials, may reject that equipment and order the Contractor to remove it from the premises at the Contractor's expense.
2. Rejection of Equipment: In case the Owner rejects a particular item of equipment, then the Contractor hereby agrees to repay to the Owner all sums of money paid to him to deliver to the Contractor a bill of sale of all his rights, title, and interest in and to the rejected equipment provided, however that the equipment shall not be removed from the premises until the Owner obtains from other sources other equipment to take the place of that rejected. The bill of sale shall not abrogate the Owner's right to recover damages for delays, losses or other conditions arising out of the basic Contract. The Owner hereby agrees to obtain the alternate equipment within a reasonable time and the Contractor agrees that the Owner may use the original equipment furnished by him without rental or other charge until the other equipment is obtained.

H. Responsibility During Tests: The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

I. Acceptance of Materials:

1. 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 acceptance of the Owner. No material shall be delivered to the work without prior submittal approval of the Engineer.
2. The Contractor shall submit to the Engineer data relating to materials and equipment he proposes to furnish for the work. Such data shall have in sufficient detail to enable the Engineer to identify particular product and to form an opinion as to its conformity to the Specifications.
3. 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 sample 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 tests.
4. The Contractor shall submit data and samples sufficiently early to permit consideration and acceptance before materials are necessary for incorporation in the work.

J. Safety Requirements:

1. In addition to the components shown and specified, all machinery and equipment shall be safeguarded in accordance with the safety features required by the current codes and regulations of ANSI, OSHA, and local industrial codes.
2. The Contractor shall provide for each V-belt drive or rotating shaft a protective guard which shall be securely bolted to the floor or apparatus. The guard shall completely enclose drives and pulleys and be constructed to comply with all safety requirements.

1.03 SUBMITTALS (SEE SECTION 01340: SHOP DRAWINGS AND SUBMITTALS)

1.04 MAINTENANCE MATERIALS

- A. All grease, oil, and fuel required for testing of equipment shall be furnished with the respective equipment. The Owner shall be furnished with a year's supply of required lubricants including grease and oil of the type recommended by the manufacturer with each item of equipment supplied.
- B. The Contractor shall be responsible for changing the oil in all drives and intermediate drives of each mechanical equipment after initial break-in of the equipment, which in no event shall be any longer than three weeks of operation.

PART 2 - PRODUCTS

2.01 FABRICATION AND MANUFACTURE

A. Workmanship and Materials:

1. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage or other failure. Materials shall be suitable for service conditions.
2. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and gages so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.
3. Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least 1/4 inch thick.

B. Lubrication:

1. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.
2. Lubricants of the type recommended by the equipment manufacturer shall be furnished by the Contractor in sufficient quantity to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation for the entire warranty period prior to acceptance of equipment by Owner. Unless otherwise specified or permitted, the use of synthetic lubricants will not be acceptable.
3. Lubrication facilities shall be convenient and accessible. Lubrication fittings shall be the zerk type for each piece of equipment. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

- #### C. Safety Guards:
- All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage or heavier galvanized or aluminum-clad sheet steel or 1/2

inch mesh galvanized expanded metal. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

D. Equipment Foundation Supports:

1. All foundations, platforms and hangers required for the proper installation of equipment shall be furnished and installed by the Contractor.
2. Unless otherwise indicated or specified, all equipment shall be installed on reinforced concrete bases at least 6 inches high and shall conform to requirements set forth in Division 3 for cast-in-place concrete. Cast iron or welded steel baseplates shall be provided for pumps, compressors, and other equipment. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components and adequate grout holes. Baseplates for pumps shall have a means for collecting leakage and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with 1 inch minimum grout. All open equipment bases shall be filled with non-shrinking grout sloped to drain to the perimeter of the base.
3. The Contractor shall furnish, install and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for the installation of equipment. These shall be of ample size and strength for the purpose intended.
4. All anchor bolts, anchor bolt templates, and location drawings required for the installation of the equipment, support columns, and for all other equipment or machinery included under this Contract shall be furnished by the Contractor. All mechanical equipment shall be anchored using hook anchor bolts, cast-in-place, unless specifically called for otherwise on the Drawings. Anchor bolts, sleeves, and inserts shall be set in place in forms and cast in the concrete by the Contractor. It shall be the responsibility of the Contractor to obtain such anchor bolts, templates, and approved location drawings in proper time to avoid delay, and it shall be his further responsibility to check and approve the location and setting of the anchor bolts, sleeves, and inserts prior to the casting of the concrete. Parts of anchors or metal work that are not built into masonry and concrete shall be coated with approved paint. Anchor bolts for column base plates and other structural elements shall be of galvanized steel unless indicated otherwise; anchor bolts for drives, motors, fans, blowers, and other mechanical equipment shall be of Type 304 stainless steel or high-strength bronze. Anchor bolts shall be of ample size and shall be provided with hexagonal nuts of the same quality of metal as the bolts. All threads shall be clean cut and of U.S. Standard sizes.

5. Expansion bolts shall have malleable iron and lead composition elements of the required number of units and sizes. Expansion bolts, if called for on the Drawings, shall be furnished and installed by the Contractor. No other use of expansion bolts will be allowed without prior approval of the Engineer.
6. Unless specified otherwise, stud, tap, and machine bolts shall be of the best quality refined bar iron. Hexagonal nuts of the same quality of metal as the bolts shall be used. All threads shall be clean cut and shall conform to ANSI B1.1-latest for "Unified and American Screw Threads for Screws, Bolts, Nuts, and Other Threaded Parts."
7. Bolts, anchor bolts, nuts, and washers not specified to be stainless steel shall be zinc-coated by the hot-dip process, after being threaded, in conformity with the ASTM Standard Specification for "Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip," Designation A123-latest, or the ASTM Standard Specification for "Zinc Coating (Hot-Dip) on Iron and Steel Hardware," Designation A153-latest, as is appropriate.
8. Anchor bolts and expansion bolts shall be set accurately. Anchor bolts which are set before the concrete has been placed shall be carefully held in suitable templates of approved design provided under this Contract. Where indicated on the Drawings, specified, or required, anchor bolts shall be provided with square plates at least 4" x 4" x 3/8" or shall have square heads and washers and be set in the concrete forms with suitable pipe sleeves, or both.
9. Structural steel supports and miscellaneous steel required for supporting and/or hanging equipment and piping furnished under this Division shall be provided and installed by Contractor.
10. All foundations, anchor pads, piers, thrust blocks, inertia blocks and structural steel supports shall be built to template and reinforced as required for loads imposed on them.
11. The Contractor shall assume all responsibility for sizes, locations and design of all foundations, anchor pads, pier, thrust blocks, inertia blocks, curbs and structural steel supports.

E. Shop Painting:

1. All steel and iron surfaces shall be protected by suitable paint or coatings applied in the shop. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment. Exposed surfaces shall be finished smooth, thoroughly cleaned, and filled as necessary to provide a smooth uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with a high-grade oil-resistant enamel suitable for coating in the field with an alkyd

enamel. Coatings shall be suitable for the environment where the equipment is installed.

2. Surfaces to be painted after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of the specified primer. Unless otherwise specified, the shop primer for steel and iron surfaces shall be Koppers "No. 10 Inhibitive Primer", or equal.
3. Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with rust-preventive compound, Houghton "Rust Veto 344", Rust-Oleum "R-9", or equal.

F. Nameplates: Contractor shall provide equipment identification nameplates for each item of equipment. Nameplates shall be 1/8 inch Type 304 stainless steel and shall be permanently fastened. Plates shall be fastened using round head metallic drive screws, or where metallic drive screws are impractical, with stainless steel pop rivets. Metallic drive screws shall be brass or stainless steel, Type V and No. 8 by 3/8 inch long. Names and/or equipment designations shall be engraved on the plates and the engraving painted with a primer and black paint system compatible with stainless steel. Contractor shall submit a list of proposed names and designations for review prior to fabrication of nameplates. At a minimum, each nameplate shall include equipment manufacturer's name, year of manufacture, serial number and principal rating data.

G. Pipe Identification:

1. All pipe (except underground) shall have code letters and flow arrows painted as per Division 9. The Contractor shall ensure that the pipes are properly marked.
2. Underground pipe and tube: Pipe and tube shall be located by laying 2 inch wide plastic tape continuously along the run of pipe or tube per Division 9.

H. Noise Attenuation and Control:

1. Unless otherwise specified, the maximum permissible noise level for a complete installed piece of equipment located within or outside a structure shall not exceed 85 dB at 3 feet. A complete piece of equipment includes the driver and driven equipment, plus any intermediate couplings, gears, and auxiliaries. All equipment provided herein that is specified to be factory and field tested shall be tested as specified herein for noise generation at the equipment manufacturer's expense.
2. Maximum permissible noise (sound pressure) levels shall be in decibels as read on the "A" weighting scale of a standard sound level meter (dB); all measurements shall be made in relation to a reference pressure of 0.0002 microbar. Measurements of emitted noise levels shall be made on a sound level meter meeting at least the Type 2 requirements set forth in ANSI S1.4, Specification for Sound Level Meters. The sound level meter shall be set on the

"A" scale and to slow response. Unless otherwise specified for a particular piece of equipment, the point of measurement of sound level shall be made at the specified distance from any major surface along the entire perimeter and at mid-height of the piece of equipment, or at the specified distance from an outer major surface encompassing the sound source including inlets or outlets.

I. Fire Hazard Rating:

1. All piping, duct work, and equipment insulation, fastener, and jacketing materials shall have a fire hazard rating not to exceed 25 for flame spread, 50 for fuel contributed, and 50 for smoke developed. Rating shall be determined by ASTM Designation E84, "Surface Burning Characteristics of Building Materials". Corresponding ratings determined by Underwriters' Laboratories, Inc., UL-723, "Test Method for Fire Hazard Classification of Building Materials", will also be acceptable.
2. Flameproofing treatments will not be acceptable.

2.02 ACCESSORIES

- A. Special Tools and Accessories: Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.
- B. Fasteners: All nuts, bolts, anchors and other fastening devices shall be a minimum of Type 304 stainless steel.

PART 3 - EXECUTION

3.01 INSTALLATION AND OPERATION

- A. Installation: Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary for proper results. When so specified, or when employees of Contractor or his subcontractors are not qualified, such personnel shall be field representatives of the manufacturer of the equipment or materials being installed.
 1. The Contractor shall have on site sufficient proper construction equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character. To minimize field erection problems, mechanical units shall be factory assembled when practical.
 2. Equipment shall be erected in a neat and workmanlike manner on the foundations and supports at the locations and elevations shown on the Drawings, unless otherwise directed by the Engineer during installation.

3. All equipment shall be installed in such a manner as to provide access for routine maintenance including lubrication.
 4. For equipment such as pumping units, which require field alignment and connections, the Contractor shall provide the services of the equipment manufacturer's qualified mechanic, millwright, machinist, or authorized representative, to align the pump and motor prior to making piping connections or anchoring the pump base.
 5. Equipment of a portable nature which requires no installation shall be delivered to a location designated by the Owner.
- B. Tolerances: Precision gauges and levels shall be used in setting all equipment. All piping and equipment shall be perfectly aligned, horizontally and vertically. Tolerances for piping and equipment installation shall be 1/2 inch to 30 ft. horizontal and vertically. All valves and operators shall be installed in the position shown on the Drawings or as directed by the Engineer, if not shown.
- C. Alignment and Level: The equipment shall be brought to proper level by shims (1/4 inch maximum). After the machine has been leveled and aligned, the nuts on the anchor bolts shall be tightened to bind the machine firmly into place against the wedges or shims. Grouting shall be as specified in Division 3.
- D. Grouting: The grout shall be tamped into position with a board, steel bar, or other tool. Tamping should not be so hard as to raise or otherwise displace the plate.
- E. Contact of Dissimilar Metals: Where the contact of dissimilar metal may cause electrolysis and where aluminum will contact concrete, mortar, or plaster, the contact surface of the metals shall be separated using not less than one coat of zinc chromate primer and one heavy coat of aluminum pigmented asphalt paint on each surface.
- F. Cutting and Patching: All cutting and patching necessary for the work shall be performed by the Contractor.
- G. Operation: All equipment installed under this Contract, including that furnished by Owner or others under separate contract, shall be placed into successful operation according to the written instructions of the manufacturer or the instructions of the manufacturer's field representative. All required adjustments, tests, operation checks, and other startup activity shall be provided.

3.02 OBSERVATION OF PERFORMANCE TESTS

- A. Where the specifications require observation of performance tests by the Engineer, such tests shall comply with the quality assurance paragraph in this section.

END OF SECTION

SECTION 15044

PRESSURE TESTING OF PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: This Section specifies the hydrostatic testing requirements for plant piping. Hydrostatic pressure and leakage testing shall be completed in accordance with AWWA C600 and C605, latest revision, however, no leakage is allowed.
- B. Testing Records:
 - 1. Provide a record of each piping installation during the testing. These records shall include:
 - a. Date of test.
 - b. Identification of pipeline tested or retested.
 - c. Identification of pipeline material.
 - d. Identification of pipe specification.
 - e. Test fluid.
 - f. Test pressure.
 - g. Remarks: Leaks identified (type and location), types of repairs, or corrections made.
 - h. Certification by Contractor that the leakage rate measured conforms to the Specifications.
 - i. Signature of Owner's representative witnessing pipe test.
 - 2. Submit five (5) copies of the test records to the Engineer's representative upon completion of the testing.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Testing fluid shall be reclaimed water for all hydrostatic tests.

- B. Provide pressure gauges, pipes, bulkheads, pumps, and meters to perform the hydrostatic testing.

PART 3 - EXECUTION

3.01 TESTING PREPARATION

- A. Pipes shall be in place and anchored before commencing pressure testing.
- B. Conduct hydrostatic tests on exposed and above ground piping after the piping has been installed and attached to the pipe supports, hangers, anchors, expansion joints, valves, and meters.
- C. Before conducting hydrostatic tests, flush pipes with water to remove dirt and debris.
- D. Test new pipelines which are to be connected to existing pipelines by isolating the new line from the existing line by means of pipe caps, plugs, special flanges, or blind flanges. After the new line has been successfully tested, remove caps, plugs, or flanges and connect to the existing piping.
- E. Conduct hydrostatic tests on buried pipe after the trench has been completely backfilled. The pipe may be partially backfilled and the joints left exposed for inspection for an initial leakage test. Perform the final test, however, after completely backfilling and compacting the trench.
- F. Pressure Test:
 - 1. All tests shall be made in the presence of and to the satisfaction of the Owner, Engineer, and any local or State inspector having jurisdiction.
 - a. Provide not less than three (3) days notice to the Owner, Engineer, and the authority having jurisdiction when it is proposed to make the tests.
 - b. Any piping or equipment that has been left unprotected and subject to mechanical or other injury shall be retested as directed by the Engineer.
 - c. The piping systems may be tested in sections as the work progresses, but no joint or portion of the system shall be left untested.
 - 2. All elements within the system that may be damaged by the testing operation shall be removed or otherwise protected during the operation.
 - 3. Repair all damage done to existing or adjacent work or materials due to performance of the tests.

3.02 HYDROSTATIC TESTING

- A. Hydrostatic Testing of Aboveground or Exposed Piping: Open vents at high points of the piping system to purge air while the pipe is being filled. Subject the piping system to the test pressure indicated in the pipe schedule. Maintain the test pressure for a minimum of four (4) hours. Examine joints, fittings, valves, and connections for leaks. The piping system shall show no leakage or weeping. Correct leaks and retest until no leakage is obtained.
- B. Hydrostatic Testing of Buried Piping:
 - 1. Where any section of the piping is concrete encased encasement, do not start the pressure test until at least 10 days after the concrete has been poured. When testing mortar-lined piping, fill the pipe to be tested with water and allow it to soak for at least 48 hours to absorb water before conducting the pressure test.
 - 2. Apply and maintain the test pressure by means of a hydraulic force pump. Maintain the test pressure for a duration of four (4) hours for pipes 12-inch and less and six (6) hours for pipes longer than 12-inch. No leakage is allowed.
 - 3. Repair and retest any pipes showing leakage.
- C. Test pressures for various pipe applications are set forth in the pipe schedule in the Drawings.

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SECTION 15050

PROCESS AND UTILITY PIPING, FITTINGS, VALVES, AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The Work included in this Section consists of furnishing all labor, equipment, and materials and performing all operations necessary for the construction or installation of all process and utility piping, valves, and appurtenances complete and ready for operation as shown on the Drawings and specified herein.
- B. Related Work Described Elsewhere
 - 1. Shop Drawings and Submittals: Section 01340.
 - 2. Operating and Maintenance Data: Section 01730.
 - 3. Warranties and Bonds: Section 01740.
 - 4. Earthwork: Section 02200.
 - 5. Concrete: Division 3.
 - 6. Metals: Division 5.
 - 7. Painting: Division 9.
 - 8. Equipment: Division 11.
 - 9. Hangers and Supports: Section 15126.

1.02 QUALITY ASSURANCE

- A. Construction Requirements
 - 1. All the buried lines on-site shall be installed with at least 36 inches of cover, unless otherwise shown or indicated on the Drawings.
 - 2. For underground utilities, changes in horizontal alignment of less than 11-1/4 degrees may be achieved through the use of allowable pipe deflection in lieu of fittings shown on the Drawings at the Contractor's option, but subject to approval of the Engineer as to layout. Said deflection shall not exceed 75 percent of the maximum allowable deflection stated in the pipe manufacturer's installation instructions.

- B. Pipe Inspection: The Contractor shall obtain from the pipe manufacturers a certificate of inspection stating that the pipe and fittings supplied for this Contract have been inspected at the plant and that they meet the requirements of these Specifications. All pipe and fittings shall be subject to visual inspection at the time of delivery and just before they are lowered into the trench to be laid. Joints or fittings that do not conform to these Specifications will be rejected and must be removed immediately by the Contractor. The entire product of any plant may be rejected when, in the opinion of the Engineer, the methods of manufacture fail to secure uniform results, or where the materials used are such as to produce inferior pipe or fittings.

1.03 SUBMITTALS

A. Shop Drawings

1. In general, the following Shop Drawings shall be submitted to the Engineer for approval prior to construction:
 - a. Mill test certificates or certified test reports on pipe and fittings.
 - b. Details of restrained and flexible joints.
 - c. Valve boxes.
 - d. All valves.
 - e. Couplings.
 - f. Pressure gauges.
 - g. Flexible expansion joints, tie rods, and flanged coupling adapters.
 - h. Joint lubricant.
 - i. Detailed piping layout drawings and pipe laying schedule (see below).
 - j. Temporary plug and anchorage system for hydrostatic pressure test.
2. Tabulated layout schedule for each pipe system including:
 - a. Pipe invert station and elevation at each change of grade and alignment.
 - b. The limits of each reach of pipe thickness class and of restrained joints.
 - c. The limits of each reach of concrete encasement.
 - d. Locations of valves and other mechanical equipment.

- e. Methods and locations of supports.
 - f. Details of special elbows and fittings.
3. A separate shop drawing submittal will be required for each major item listed above and for each different type of an item within a major item. For example, separate submittals will be required for butterfly, solenoid, check, and automatic air release valves. All submittals shall be in accordance with the General and Special Conditions and Section 01340: Shop Drawings, Working Drawings, and Samples.
- B. Acceptance of Material
- 1. The Contractor shall furnish an affidavit of compliance certified by the pipe manufacturer that the pipe, fittings, and specials furnished under this Contract comply with all applicable provisions of current AWWA and ASTM Standards and these Specifications. No pipe or fittings will be accepted for use in the Work on this project until the affidavit has been submitted and approved by the Engineer.
 - 2. The Owner reserves the right to sample and test any pipe or fitting after delivery and to reject all pipe and fittings represented by any sample which fails to comply with the specified requirements.
- C. Operation and Maintenance Manuals: Submit operation and maintenance manuals for applicable components requiring periodic maintenance and/or explanation of operation. Manuals shall be prepared in accordance with Section 01730: Operating and Maintenance Data. Information shall include:
- 1. Detailed assembly drawings, clear and concise instructions for operating, adjusting, overhauling, troubleshooting and other maintenance. Include shop drawings previously submitted and approved with all corrections made.
 - 2. A complete lubrication schedule including lubricant types, grades, and recommended frequency of lubrication.
 - 3. A list of parts for all products with catalog numbers and all data necessary for ordering replacement parts. Such instructions and parts lists shall be prepared for the specific product furnished and shall not refer to other types or models.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Pipe, fittings, valves, and accessories shall be handled in a manner that will ensure a sound undamaged condition during shipping, delivering and installing.
- B. Particular care shall be taken not to injure the pipe coating and linings.
- C. Insides of valves and piping shall be kept free of dirt and debris.

1.05 JOB CONDITIONS

- A. Water in Excavation: Water shall not be allowed in the trenches while underground pipes are being laid and/or tested. The Contractor shall not open more trench than the available pumping facilities are able to dewater to the satisfaction of the Engineer. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working. In no case shall the pipelines being installed be used as drains for such water, and the ends of the pipe shall be kept properly and adequately plugged during construction by the use of approved plugs or caps and not by improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of the work any such materials have entered the pipelines, it must be cleaned as directed by the Engineer so that the entire system will be left clean and unobstructed.

1.06 PIPE MATERIAL SCHEDULE

- A. Unless noted otherwise all process piping 4-inches in size and larger shall be ductile iron.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

- A. Ductile Iron Pipe: Ductile iron pipe shall conform to the requirements of ANSI, A21.51 and AWWA C151, latest revision. The minimum pressure class for underground pipes shall be Class 150. Pipe shall be furnished in lengths of 20 feet or less, unless specifically shown otherwise on the Drawings. Flanged pipe shall have a minimum thickness class of Class 53. All pipe and fittings shall be new and unused, no refurbished piping or fittings will be accepted.
- B. Coating and Lining
 - 1. Corrosion Resistant Interior Lining: Where indicated on the Pipe Schedule ductile iron pipe, fittings, and specials shall be lined with Protecto 401 Ceramic Epoxy with a minimum dry film thickness of 40 mils applied by the pipe manufacturer. Storage, surface preparation, application, and safety precautions shall strictly follow manufacturer's instructions. When a corrosion resistant lining is not required, standard cement mortar lining shall be provided.
 - 2. Exterior Coatings: Where ductile iron pipe and fittings are to be below ground or installed in a casing pipe the exterior coating shall be a minimum 1.0 mil thick in accordance with ANSI/AWWA A21.51/C151.
 - 3. Exterior Coating for Exposed Pipe: Ductile iron pipe, fittings, and specials to be installed aboveground shall be furnished with a shop applied primer on the exterior. The shop primer shall be as specified in Section 09900: Painting.

- C. Fittings: Fittings for ductile iron pipe shall be either mechanical joint, restrained joint, or flanged joint as indicated on the Drawings and shall have a minimum working pressure of 350 psi. Fittings shall be ductile iron and shall conform to ANSI/AWWA C110/A21.10, ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53, latest revisions for flanged and mechanical joint pipe. Fittings shall be coated and lined in the manner specified above for ductile iron pipe. The rubber gaskets for flanged, mechanical, and push-on joints shall be as described below.
- D. Push-On Joints: Pipe using push-on joints shall be in strict accordance with ANSI/AWWA C111/A21.11, latest revision and shall be as manufactured by American Cast Iron Pipe Company (Fastite Joint), United States Pipe Company (Tyton Joint), or Clow Corporation (Super Bell Tite Joint). Jointing materials shall be provided by the pipe manufacturer, and installation shall be in strict accordance with the manufacturer's recommended practice. For process air service, joint materials shall be rated for an operating temperature of at least 300°F.
- E. Mechanical Joints: Jointing materials for mechanical joints shall be provided by the pipe and fitting manufacturer. Materials assembly and bolting shall be in strict accordance with ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53, latest revisions. Tee head bolts and nuts for mechanical joints shall be manufactured of high strength, low alloy steel in accordance with ANSI/AWWA C111/A21.11.
- F. Flanged Joints: Flanges shall be Class 125 per ANSI B16.1 with any special drilling and tapping as required to ensure correct alignment and bolting.
1. Gaskets:
 - a. Liquid Service: Fullface, 1/8-inch thick, cloth-inserted rubber: Johns-Manville No. 109, John Crane Co., Style 777, or equal. Gaskets shall be suitable for a water pressure of 350 psi at a temperature of 180°F.
 2. Bolts, nuts, and washers for flanges shall be of Type 316 stainless steel.
 3. Flanges shall be long-hub type screwed tightly on pipe by machine at the foundry prior to facing and drilling. Flange machine surfaces shall be coated with rust inhibitor immediately after facing and drilling. Field assembled screwed on flanges are prohibited.
- G. Restrained Joints and Fittings: Pipe joints and fittings shall be restrained in accordance with the Drawings and the requirements of this Specification. In cases where the calculated required length of restrained pipe is not evenly divisible by nominal laying lengths of pipe, the total required length of restrained pipe shall be rounded up to the next closest nominal length that is evenly divisible by the standard laying length.
1. Manufactured Restrained Joints: Manufactured restrained joints shall be Flex-Ring, Lok-Ring, or Lok-Fast manufactured by the American Cast Iron Pipe Company, Lok-Tyte or TR-Flex Type manufactured by the United States Pipe Company, or an equal approved by the Engineer.

2. Restrained joint pipe and fittings shall be ductile iron only and shall comply with applicable portions of this Specification. Manufactured restrained joints shall be capable of deflection during assembly. Deflection shall not exceed 75 percent of the manufacturer's recommendations.
 3. Tee head bolts and nuts for restrained joints shall be manufactured of high strength, low alloy steel in accordance with ANSI/AWWA C111/A21.11.
- H. Alternate Restrained Joints: Ductile iron pipe and fittings with mechanical joints shall be restrained using a follower gland which includes a restraining mechanism. When actuated during installation, the restraining device shall impart multiple wedging action against the pipe wall which increases resistance as internal pressure in the pipeline increases.
1. The joint shall maintain flexibility after installation. Glands shall be manufactured of ductile iron conforming to ASTM A536 and restraining devices shall be of heat-treated ductile iron with a minimum hardness of 370 BHN. The gland shall have standard dimensions and bolting patterns for mechanical joints conforming to ANSI/AWWA C111 and C153, latest revisions.
 2. Tee head bolts and nuts shall be manufactured of corrosion-resistant, high strength, low alloy steel in accordance with ANSI/AWWA C111/A21.11.
 3. The restraining wedges shall have twist-off nuts to ensure proper torquing. The mechanical joint restraint device shall have a minimum working pressure rating of 250 psi with a minimum safety factor of 2 to 1 and shall be MEGALUG[®] as manufactured by EBBA Iron, Inc.

2.02 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- A. Schedule 80 PVC pipe conforming to ASM D1785.
1. Fittings: Socket type, solvent welded fittings for Schedule 80 PVC pipe shall be in conformance with ASTM D2467.
 2. Flanges: Flanges for Schedule 80 PVC pipe shall be rated for a 150 psi working pressure with ANSI B 16.1 dimensions and bolting pattern. Flanges shall be connected to PVC piping with either solvent welded or threaded joints in accordance with ASTM D2467 or ASTM 2464, respectively. Gaskets shall be neoprene, full faced type with a minimum thickness of 1/8-inch. Bolts, nuts and washers for flanges shall be Type 304 stainless steel. Steel flat washers, with lock washers, shall be used against PVC flanges. Copper antisieze shall be applied to threads.
 3. Solvent Cement: PVC solvent cement shall be in compliance with ASTM D2564 and in accordance with the pipe manufacturer's recommendations.

4. Thread Lubricant: Lubricant for Schedule 80 threaded joints shall be Teflon tape only.

2.03 FLANGED COUPLING ADAPTERS

- A. Adapters shall be suitable for joining plain-end pipe to flanged pipes and fittings. Adapters shall conform in size and bolt hole placement to ANSI standards for steel and/or cast iron flanges, 125 or 150 pound standard, unless otherwise required for connections (ANSI B16.1 125 lb./ANSI B16.5 150 lb.).
- B. Adapters shall be constructed of ductile iron or steel and coated in accordance with Section 09900: Painting. Bolts, nuts, and washers shall be Type 304 stainless steel. Bolts and nuts greater than 1 1/8 inches in diameter shall be carbon steel ASTM A307, Grade B, with cadmium plating, ASTM A165, Type NS. Gasket material shall be suitable for exposure to the liquids to be contained within the pipes. All adapters shall be restrained to prevent axial movement. The restraint system shall be rated for a working pressure of at least 150 psi.
- C. Adapters shall be Romac, Smith-Blair, Dresser, or equal.

2.04 PLUG VALVES

- A. Plug valves shall be non-lubricated 100% full port eccentric type with flanged or mechanical joint ends as specified below. Valves shall open by turning to the left (counterclockwise) when viewed from the stem. Valve pressure ratings, body flanges, and wall thicknesses shall be in full conformance with ANSI B16.1, latest revision. Valves shall seal leak-tight against full rated pressure in both directions. Prior to shipment from the factory, each valve shall be hydrostatically tested as follows. Valve seats shall be tested to provide leak tight shut off to 175 psi for valves through 12-inch and 150 psi for valves 14 inches and larger, with pressure in either direction. In addition, a hydrostatic shell test shall be performed with the plug open to a pressure twice that of rating specified above to demonstrate overall pressure integrity of the valve body. Plug valves shall be eccentric plug valves as manufactured by DeZurik, Milliken, or an approved equal.
- B. Valve bodies shall be constructed of high strength cast iron conforming to ASTM A126, Class B and AWWA C504, latest revisions. Valve seats shall be formed by cast bodies with raised eccentric seats which have a corrosion-resistant welded-in overlay of not less than 90 percent pure nickel on all surfaces contacting the plug face. Valve seats shall be in accordance with AWWA C504 and AWWA C507, latest revisions. Valves shall be furnished with resilient faced plugs with neoprene facing, suitable for use with sludge. Valves shall be furnished with replaceable, permanently lubricated, stainless steel or fiberglass-backed woven Teflon fiber, sleeve-type bearings in the upper and lower plug stem journals. Plug stem bearings shall comply with AWWA C504 and C507, latest revisions.
- C. Valves shall be bolted bonnet design. Valve shaft seals shall be designed so that they can be repackaged without removing the bonnet and the packing shall be adjustable.

Packing material shall be Buna-Vee type packing. Valve shaft seals shall be in accordance with AWWA C504 and AWWA C507, latest revisions. All exposed valve nuts, bolts, springs, washers, and the like shall be Type 316 stainless steel.

- D. All interior ferrous surfaces of the valve, except the valve seating surfaces, shall be coated with a factory applied, fusion-bonded or thermosetting epoxy coating in accordance with AWWA C550, latest revision. Coating shall be holiday-free with a minimum thickness of 12 mils. Surfaces shall be clean, dry, and free from rust, oil, and grease before coating.
- E. All exterior surfaces of plug valves shall be clean, dry, and free from rust and grease before coating. For buried service, the exterior ferrous parts of all valves shall be coated at the factory. For valves installed aboveground, the exterior ferrous parts of all valves shall be shop primed at the factory with one coat, minimum dry film thickness 2 – 3.5 mils, of a lead and chromate-free primer with rust-inhibitive pigments and synthetic resins. Primer shall be suitable for finish paint specified. Following installation, above-ground valves shall be finish painted in accordance with Section 09900: Painting.
- F. All plug valves installed above ground, in valve vaults, or on flanged piping shall have flanged ends as specified for ductile iron pipe. Flanges shall comply with facing, drilling, and thickness of ANSI Standards for Class 125 dimensions.
- G. Each aboveground plug valve shall be furnished with a mechanical gear actuator furnished with a handwheel. Gear actuator shall be sized for the maximum pressure differential across the valve, equal to the pressure rating of the valve. All gearing shall be enclosed in a high strength cast iron housing, suitable for running in a lubricant. Housing shall be provided with seals on all shafts to prevent the entry of dirt and water into the actuator. Actuator shaft and quadrant shall be supported on permanently lubricated bronze bearings. Actuator shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque.

2.05 GATE VALVES

- A. Bronze Gate Valves: Gate valves installed above ground, 2 inches in size and smaller, shall be Class 150 all bronze valves conforming to Fed. Spec. WW-V-54d, Type 1, Class B designed for a non-shock water pressure of 300 psi. Bronze for valve body and internals shall be in accordance with ASTM B16.18. Valves shall be furnished with screwed ends, handwheel operator, non-rising stem, one-piece solid wedge disc and screwed bonnet. Valves shall be as manufactured by Crane, Powell, or an approved equal. The minimum weight of valves shall be as follows:

<u>Valve Size (Inches)</u>	<u>Valve Weight (Pounds)</u>
1/2	1.0
3/4	1.5
1	2.5
1-1/4	3.6
1-1/2	4.6
2	7.6

B. Iron Gate Valves

1. Iron gate valves shall open by turning to the left (counterclockwise), when viewed from the stem. When fully open, gate valves shall have a clear waterway equal to the nominal diameter of the pipe. Operating nut or handwheel shall have an arrow cast in the metal indicating the direction of opening. Each valve shall have the manufacturer's distinctive marking, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by applying to it a hydrostatic pressure equal to twice the specified working pressure. Hydrostatic and leakage tests shall be conducted in strict accordance with ANSI/AWWA C500 or ANSI/AWWA C509, latest revisions, whichever is applicable.
2. Gate valves with nominal sizes from 2 to 2 1/2 inches shall conform to ANSI/AWWA C500, latest revision, and shall be designed for a minimum working pressure of 200 psi. Valves shall be iron body, bronze-mounted, double disc, parallel seat, non-rising stem type with double, Buna-N, O-ring stem seals. Bronze items of construction shall include the stems, seat rings, stem nuts, wedge bushings, and upper and lower wedges. Bronze used for construction of these items shall be low zinc alloy bronze. Valve ends shall be screwed and as specified for steel pipe and fittings. Interior ferrous surfaces of valve, except for finished or bearing surfaces, shall be coated with a fusion bonded or thermo-setting epoxy coating in accordance with AWWA C550, latest revision. Gate valves for this size range shall be as manufactured by American-Darling Valve Company, Kennedy Valve Manufacturing Company, Dresser Industries, Inc., or an approved equal.
3. Gate valves with nominal sizes from 3 inches and larger shall conform to ANSI/AWWA C509, latest revision, and shall be designed for a minimum working pressure of 200 psi. Valves shall be iron body, resilient wedge type with O-ring stem seals. The valve stem, stem nut, glands, and bushings shall be bronze. Valve disc shall be constructed to assure uniform seating pressure between disc seat ring and body seating surface. Resilient seat of valve shall be formed by a special corrosion resistant, synthetic elastomer which is permanently bonded to and completely encapsulates a cast iron valve disc. Valve ends for underground installation shall be mechanical joint as specified for ductile iron pipe and flanged for above-ground valves. Interior of valve body shall be coated with a fusion bonded or thermo-setting epoxy coating in accordance with AWWA C550, latest revision. Coating shall be holiday-free, NSF approved, with a minimum thickness of 16 mils. Surfaces shall be clean, dry, and free from rust and grease before coating. Exterior surfaces of buried valves shall be coated with epoxy in accordance with AWWA C550. Exterior surfaces of exposed valves shall be shop primed and field coated in accordance with Section 09900: Painting. Resilient-seated wedge type gate valves shall be manufactured by A.F.C. (American-Darling, Waterous), Clow, U.S. Pipe, M&H, Kennedy, Mueller, Tyler, or an approved equal.

4. Valve Operators: Unless otherwise shown on the Drawings or specified herein, gate valves shall have non-rising stems. Each buried gate valve shall be furnished with a 2-inch square AWWA standard nut operator with a valve box and cover. Gate valves located aboveground or inside structures shall be furnished with a handwheel operator which shall have an arrow cast in the metal indicating the direction of opening. Gate valves used as isolation valves for reduced pressure back flow preventers shall be of the outside screw and yoke (OS&Y) design with a handwheel operator.

2.06 BUTTERFLY VALVES (STANDARD SERVICE)

- A. Butterfly valves for liquid service, 4 inches in size and larger, shall be Class 150-B in conformance with ANSI/AWWA C504, latest revision and designed for a minimum working pressure of 150 psi. Butterfly valves shall be of the tight closing rubber seat type. Valves shall be bubble tight with 150 psi on the upstream side of the valve and 0 psi on the downstream side and shall be satisfactory for applications involving valve operation after long periods of inactivity. Valve discs shall rotate 90 degrees from the fully open position to the fully closed position. Butterfly valves shall be as manufactured by American-Darling Valve Company, M&H, Kennedy Valve Manufacturing Company, Mueller Company, DeZurik, Henry Pratt Company, or an approved equal.
- B. Valve bodies shall be constructed of high-strength cast iron conforming to ASTM A126, Class B. Buried valves shall have integrally cast mechanical joint ends as specified for ductile iron pipe and above-ground valves shall have cast iron flanges. End flanges shall conform in dimensions and drilling to ANSI B16.1, Class 125. Two trunnions for shaft bearings shall be integral with each valve body. Valve body thickness shall be in strict accordance with ANSI/AWWA C504 latest revision for Class 150-B valves.
- C. Valve seat ring shall be constructed of Type 304 stainless steel. Seating edges of the seat ring shall be smooth and polished. The seat ring shall be capable of compensating for changes in direction of flow to assure a bubble tight seal in either direction.
- D. Valve discs shall be solid (no cores) for 24-inch and smaller valves, and shall be either solid or hollow core for valves greater than 24-inch. Discs shall be constructed of ASTM A536, Grade 65-45-12 ductile iron. Valve disc shall be of the offset design to provide 360-degree uninterrupted seating.
- E. Valve shafts may consist of a one-piece unit extending completely through the valve disc bearings and into the operating mechanism or may be of the "stub shaft" type, which comprises two separate shafts inserted into the valve disc hubs. If used, stub shafts shall extend a minimum of 1 1/2 shaft diameters into the valve disc hubs. Valve shafts shall be constructed of ASTM A276, Type 304 stainless steel or a stainless steel with greater overall corrosion and oxidation resistance. The minimum shaft diameter shall conform to ANSI/AWWA C504, latest revision for Class 150B valves. The valve disc shall be attached to the shaft by means of "O" ring sealed taper pins. The valve shaft seal shall consist of "O" rings in a bronze cartridge or self-adjusting nitrile Vee-type ring seals.

- F. Valve seats shall be of a corrosion resistant synthetic rubber compound bonded to a high-grade stainless steel retaining ring and secured to the valve disc by Type 304 stainless steel set screws or shall be molded in, vulcanized, and bonded to the body. Seats bonded to the body shall withstand a 75-pound pull tested in accordance with ASTM D429, Method B. The valve seat shall be adjustable and replaceable in the field without dismantling operator, disc, or shaft.
- G. Valve shafts shall be fitted with sleeve-type bearings. Bearings shall be corrosion resistant and self-lubricating (Nylon or Teflon). Bearings shall be designed for a pressure not exceeding the published design load for the bearing material, or 1/5 of the compressive strength of the bearing or shaft material.
- H. All butterfly valves shall open left or counterclockwise when viewed from the stem. Manual valve operators shall be of the worm gear or traveling nut type and shall be fully enclosed. All operators shall have adjustable mechanical stop limiting devices to prevent over travel of disc. Should an adjustment of the disc be required to maintain a bubble tight seal, this adjustment shall be made externally without removing the operator housing cover. The operator shall be designed such that all adjustments can be made under pressure and without the possibility of dirt getting into the operator lubricant. Any adjustments through the lower shaft will not be acceptable. Units furnished for buried service shall be fully gasketed and grease packed. Manual valves located above ground shall be equipped with handwheel or chainwheel operators and shall have a suitable indicator arrow to give valve position from fully open to fully closed. Each buried butterfly valve shall be furnished with a 2-inch square AWWA nut operator with valve box and cover. Operator components shall, at the extreme operator positions, withstand without damage a pull of 200 lbs. for handwheel or chainwheel operators or an input torque of 300 ft.-lbs. for operating nuts.
- I. Interior of valve body and valve disc except for valve seat and stainless steel valve seat ring shall be coated with a fusion bonded or thermosetting epoxy coating in accordance with AWWA C550, latest revision. Coating shall be holiday-free, NSF approved, with a minimum thickness of 16 mils. Surfaces shall be clean, dry, and free from rust and grease before coating.
- J. All exterior surfaces of butterfly valves shall be clean, dry, and free from rust and grease before coating. For buried service, the exterior ferrous parts of all valves shall be coated at the factory with epoxy in accordance with AWWA C550. For valves installed aboveground, the exterior ferrous parts of all valves shall be shop primed at the factory with one coat, minimum dry film thickness of 4 mils, of a rust inhibitive, universal epoxy primer. Primer shall be suitable for finish paint specified. Following installation, aboveground valves shall be finish painted in accordance with Section 09900: Painting.
- K. Prior to shipment from the factory, hydrostatic and leakage tests shall be conducted for each butterfly valve. Hydrostatic and leakage tests shall be conducted in strict accordance with ANSI/AWWA C504, latest revision, and results shall be submitted to the Engineer.

2.08 VALVE BOXES

- A. Furnish, assemble, and place a valve box over the operating nut for each buried valve. The valve box shall be designed to prevent the transmission of surface loads directly to the valve or piping.
- B. Valve boxes shall be of the adjustable slide-type of suitable length with an interior diameter of not less than 5 inches. The valve boxes shall be manufactured of cast iron and shall be of the two-piece design including a bottom section and top section with cover. The cast iron cover shall be cast with the applicable service, "WATER", "REUSE", "SEWER", etc., markings. The top section shall be adjustable for elevation and shall be set to allow equal movement above and below finished grade. The tops of the valve boxes for the potable water mains and sanitary force mains shall be round. The tops of the valve boxes for reuse mains shall be square.
- C. The castings shall be manufactured of clean, even grain, gray cast iron conforming to ASTM A48, Class 30B for Gray Iron Castings; and shall be smooth, true to pattern, free from blow holes, sand holes, projections, and other harmful defects. The seating surfaces of both the cover and the top section shall be machined so that the cover will not rock after it has been seated.
- D. The valve boxes shall be coated inside and outside with an asphaltic coating prior to machining, so that the machined seating surfaces will be free of any coating. Valve extension stems shall be provided for all buried valves when operating nut is deeper than 3 feet below final grade.
- E. Valves boxes shall be manufactured by Tyler, American Flow Control, Rusco, or an approved equal.

2.09 WALL SEALS

- A. Wall Sleeve Seals: Wall sleeve seals shall be modular mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve. The synthetic rubber shall be suitable for exposure to water, wastewater, and groundwater. Pressure plates shall be of nylon polymer and bolts, nuts, and washers shall be Type 316 stainless steel. The seals shall be Link Seal as manufactured by Thunderline Corporation or an approved equal.

2.10 BALL VALVES

- A. Ball valves in PVC piping shall be true-union valves rated for 150 psi. The body and ball shall be manufactured from PVC and sealing elements shall be of Viton. Ball valves shall be manufactured by Plast-O-Matic, Spears, Asahi or an approved equal.

- B. Ball valves in stainless steel piping shall be threaded true-union valves constructed of Type 316 stainless steel. The valves shall be rated for 150 psi and manufactured by Jamesbury or an approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. All pipe, fittings, valves, and other material shall be subject to inspection and approval by the Engineer after delivery, and no broken, cracked, imperfectly coated, or otherwise damaged or unsatisfactory material shall be used. When a defect or crack is discovered, the damaged portion shall not be installed. Cracked pipe shall have the defect cut off at least 12 inches from the break in the sound section of the barrel.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Excavation, backfill, and compaction shall conform to the provisions of Section 02200: Earthwork. Upon satisfactory installation of the pipe bedding material as specified in Section 02200, Earthwork, a continuous trough for the pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom.
- B. Cover for underground piping shall not be less than that indicated on the Drawings. The minimum cover for pipe shall be 36 inches. In areas where other piping conflicts preclude the cover desired, the piping shall be laid to provide the maximum cover obtainable.
- C. Pipe, fittings, valves, and accessories shall be installed as shown or indicated on the Drawings.
- D. All connections to existing piping systems shall be made as shown or indicated on the Drawings after consultation and cooperation with authorities of the Owner. Some such connections may have to be made during off-peak hours (late night or early morning).
- E. Pipe Joint Deflection: Whenever it is desirable to deflect pipe joints to avoid obstructions or to maintain required alignment, the amount of the joint deflection shall not exceed 75 percent of the maximum limits allowed by the pipe manufacturer.
- F. In preparation for pipe installation, placement (stringing) of pipe should be as close to the trench as practical on the opposite side of the trench from the excavated material. The bell ends of the pipe should point in the direction of the work progress.
- G. Pipe and fittings shall be laid accurately to the lines and grades indicated on Drawings. Where grades for the pipeline are not indicated on the Drawings, maintain a uniform depth of cover with respect to finish grade. Care shall be taken to ensure a good alignment both horizontally and vertically and to give the pipe a firm bearing along its

entire length. Any pipe which has its grade or joint disturbed after laying shall be taken up and relayed.

- H. All pipe and fittings shall be cleared of sand, dirt, and debris before laying. All precautions shall be taken to prevent sand, dirt, or other foreign material from entering the pipe during installation. If necessary, a heavy, tightly woven canvas bag of suitable size shall be placed over each end of the pipe before lowering into the trench and left there until the connection is made to the adjacent pipe. Any sand, dirt, or other foreign material that enters the pipe shall be removed from the pipe immediately. Interior of all pipe and fittings shall be kept clean after installation until accepted in the complete Work.
- I. Any time that pipe installation is not in progress, the open ends of pipe shall be closed by a watertight plug or other method approved by the Engineer. Plugs shall remain in pipe ends until all water is removed from the trench. No pipe shall be installed when trench conditions are unsuitable for such work, including standing water, excess mud, or rain.
- J. After pipe has been laid, inspected, and found satisfactory, sufficient backfill shall be placed along the pipe barrel to hold the pipe securely in place while conducting the preliminary hydrostatic test. No backfill shall be placed over the joints until the preliminary test is satisfactorily completed, leaving them exposed to view for the detection of visible leaks.
- K. Upon satisfactory completion of the hydrostatic test, backfilling of the trench shall be completed.
- L. Above Ground and Exposed Piping: Piping shall be cut accurately to measurements established at the job site and shall be worked into place without springing or forcing, properly clearing all equipment access areas and openings. Changes in sizes shall be made with appropriate reducing fittings. Pipe connections shall be made in accordance with the details shown and the manufacturer's recommendations. Open ends of pipelines shall be properly capped or plugged during installation to keep dirt and other foreign material out of the system. Pipe supports and hangers shall be provided where indicated or as required to ensure adequate support of the piping.

3.03 INSTALLATION OF DUCTILE IRON PIPE

- A. All ductile iron pipe and fittings shall be laid in accordance with American Water Works Association Standard ANSI/AWWA C600, latest revision, entitled "Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances".
- B. Restrained Joints: Restrained joints shall be provided where indicated on the Drawings. Joint assembly shall be made in strict accordance with the manufacturer's instructions, which shall be submitted to the Engineer for review and approval before commencing work.

- C. Flanged Joints: Flanged joints shall be made up by inserting the gasket between the flanges. The threads of the bolts and the faces of the gaskets shall be coated with suitable lubricant immediately before installation.
1. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing and lubricate bolts with oil and graphite.
 2. Insert the nuts and bolts (or studs), finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.
 3. Exercise care when tightening joints to prevent undue strain upon valves, pumps, and other equipment.
 4. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

3.04 INSTALLATION OF VALVES

- A. Valves of the size and type shown on the Drawings shall be set plumb and installed at the locations indicated on the Drawings. Valves shall be installed in accordance with manufacturer's installation instructions and with the details shown on the Drawings.
- B. Valves shall be installed such that they are supported properly in their respective positions, free from distortion and strain. Valves shall be installed such that their weight is not borne by pumps and equipment that are not designed to support the weight of the valve.
- C. Valves shall be carefully inspected during installation; they shall be opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Check and adjust all valves for smooth operation.
- D. Install valves with the operating stem in either horizontal or vertical position.
- E. Allow sufficient clearance around the valve operator for proper operation.
- F. Clean iron flanges by wire brushing before installing flanged valves. Clean carbon steel flange bolts and nuts by wire brushing, lubricate flange bolt threads with oil or graphite, and tighten nuts uniformly and progressively. Clean threaded joints by wirebrushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.
- G. For buried valves, a valve box shall be centered accurately over the operating nut and the entire assembly shall be plumb. The tops of valve boxes shall be adjusted to the proper elevation as specified below and as shown on the Drawings.

- H. Valves shall be tested hydrostatically, concurrently with the pipeline in which they are installed. Protect or isolate any parts of valves, operators, or control and instrumentation systems whose pressure rating is less than the pressure used for the pressure tests. If valve joints leak during pressure testing, loosen or remove the nuts and bolts, reseal or replace the gasket, reinstall or retighten the bolts and nuts, and hydrostatically retest the joints.
- I. Following installation, all above-ground valves shall be painted in accordance with the painting system specified in Section 09900: Painting.

END OF SECTION

SECTION 15090

CHEMICAL FEED SYSTEM PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope or Work:

1. This Section covers furnishing and installation of piping and piping accessories for chemical feed systems.
2. Double wall containment piping systems are required for all chemical feed lines unless otherwise noted. The double wall containment piping shall be used when the piping is in contact with the ground, located in the trenches or any other location indicated on the Drawings.
3. Piping shall be furnished and installed complete with all fittings, jointing materials, hangers, supports, anchors, and other necessary appurtenances.

B. General Design (Not Applicable)

1.02 SUBMITTALS

A. Materials and Shop Drawings: Complete specifications, data, and catalog cuts or drawings covering the following items furnished under this section shall be submitted in accordance with the general conditions and Section 01340 - Shop Drawings and Submittals.

1. Expansion joints for PVC pipe.
2. Flange gaskets.
3. PVC chemical service pipe and fittings.
4. Pipe sleeves.
5. Pipe supports.

1.03 OPERATIONS AND MAINTENANCE DATA

A. Operating and Maintenance Manual: Furnish Operation and Maintenance Manuals in accordance with Section 01730 - Operating and Maintenance Data.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Chemical feed pipe shall be delivered to the site in unbroken bundles packaged in such manner as to provide protection against damage. When possible pipe should be stored at the job site in the unit packages until ready for use. Packaged units shall be handled using a fork lift or a spreader bar with fabric straps. Packaged units shall not be stacked at the job site higher than two units high.
- B. Chemical feed pipe stored for more than 30 days, exposure to direct sunlight shall be prevented by covering the pipe with an opaque material. Adequate air circulation above and around the pipe shall be provided as required to prevent excessive heat accumulation. Pipe shall not be stored close to heat sources or hot objects such as heaters, fires, boilers or engine exhaust. Pipe gaskets shall be protected from excessive exposure to heat, direct sunlight, ozone, oil and grease. The interior and all sealing surfaces of pipe, fittings and other appurtenances shall be kept clean and free of dirt and foreign matter.
- C. Care shall be taken in handling and laying pipe and fittings to avoid severe impact blows, crushing, abrasion damage, gouging or cutting. Pipe shall be lowered, not dropped, from trucks or into trenches. All cracked, damaged or defective pipe and fittings, or any length of pipe having a gouge, scratch or other permanent indentation of more than 10 percent of the wall thickness in depth, shall be rejected and removed at once from the work and replaced with new acceptable pipe at no additional cost to the Owner.

1.05 WARRANTY AND GUARANTEES

- A. Provide equipment warranty in accordance with Section 01740 - Warranties and Bonds.

PART 2 - PRODUCTS

2.01 GENERAL (Not Applicable)

2.02 MATERIALS AND EQUIPMENT

- A. Polyvinyl Chloride (PVC) Pipe and Fittings:
 - 1. Materials for polyvinyl chloride chemical pipe, valves and fittings shall be as specified in Section 15050 - Process and Utility Piping, Fittings, Valves and Accessories.
 - 2. Joints and jointings shall be as specified in Section 15050 - Process and Utility Piping, Fittings, Valves and Accessories.
 - 3. All bends shall be long radius bends.

B. Carrier Tubing:

1. Provide PVC tubing with wire yarn reinforcement embedded in the wall of the tubing with smooth inside bore and smooth outside. The color of the tubing shall be consistent with color coding set for in 10 State Standards. Minimum operating pressure shall be 250 psi for ½-inch tubing 225 for ¾-inch at 70° F. Burst pressure shall be at least 4.0 times the specified operating pressure. Join tubing to pipe with a Kynar single-barb male by male NPT adapter fitting. Secure tubing to the fitting with a stainless steel hose clamp. Connect tubing sections by means of single or multi-barb Kynar couplings with stainless steel hose clamps.
2. Products: Kuriyama "Kuri-Tech Polywire K7300 yarn reinforced", or equal.
3. Clear PVC hose shall be kept out of direct sunlight.

C. Piping Schedule:

1. Refer to the Drawings for the conditions of service and hydrostatic testing requirements.

D. Ball Valves for Chemical Storage Tank Discharge and/or Drain Isolation: Provide PVC ball valves in chemical applications accordance with Section 15050.

E. Quick-Connect Couplers for Chemical Service

1. Quick-connect couplers shall be male-adapter/hose-shank type. Provide dust cap with security chain with each coupler. Bodies shall be glass fiber reinforced polypropylene. Locking handles shall be stainless steel. Gasket shall be Teflon.
2. Products: Evertite Part C/DC, Banjo Corporation Male Adapter/Hose Shank and Dust Cap, Murray Equipment Inc. Style E, or equal.

F. Vacuum Breakers

1. Vacuum breakers shall have PVC body and Viton diaphragm and seals. The diaphragm shall unseat at 2-inch Hg vacuum and allow air to enter the system. Ends shall be threaded or socket welded. Vacuum breaker valve shall be Plast-O-Matic Series VBM, Ryan Herco, Harrington Industrial Plastics, or equal.

G. Duckbill-Shaped Check Valves, 1 Through 3 Inches, Slip-On

1. Valve shall consist of a contoured rubber body with a duckbill sleeve-type exit. The valve shall be installed by slipping over the end of an exposed piece of pipe, and is fastened with compression clamps. The inside diameter of the valve's cuff shall be fabricated to exactly match the outside diameter of the pipe. The valve shall have a flare on the top and bottom. Material of construction of

Hypalon Coated valves shall be Viton for sodium hypochlorite applications. Provide Type 316 stainless steel compression clamp. The valve shall open at differential pressure of 2-inches of water column and shall close under a no-flow condition. Products: Red Valve Company "Tideflex" Modified Series TF-2 or equal.

H. Gasket, Seat and Seal Materials:

1. Viton or Teflon (PTFE)

I. Pipe Supports:

1. Pipe supports shall be non-metallic, fiberglass reinforced plastic structural shapes. Channel framing shall be 1-5/8 inches deep by 1-5/8 inches wide and shall be made using vinylester resin equal to Derakane 411, Ashland Hetron 922, or Reichhold Dion 9800. It shall have a nexus polyester surfacing veil over 100% of the surface which, along with a filler system, will protect against degradation from ultraviolet light.
2. Channel shall be supplied with integral notches 1 inch on center. Notches shall be located on the interior flange to prevent slippage of pipe clamps and fittings after installation. In place of notched channel, unnotched channel may be used if the vertical channel sections supporting the horizontal piping are provided with stop lock hardware at each pipe clamp to prevent slippage. Channel framing shall be Aickinstrut G.R.P. Type V 2000 series or equal.
3. Channel framing connections shall be made with vinylester glass fiber composite nuts, bolts, all threaded rods, channel fittings, bases, and hanger assemblies. Nut, bolts, and rods shall be Aickinstrut 4200 series, Strut Tech PVCG, or equal. Channel fittings shall be Aickinstrut 2800 style or equal.
4. Load bearing pipe clamps and nonload bearing pipe straps shall be nonmetallic and nonconductive and shall be made by the injection molding process using polyurethane base resin. Pipe clamps and straps shall be Aickinstrut 3100 series or equal.
5. Clevis hangers shall be made with vinylester glass fiber and be Aickinstrut 1500 series or equal.
6. Hanger rods for trapezes shall be non-metallic vinylester glass composite rod.
7. Products: FRP pipe hangers and supports shall be Aickinstrut, Inc., Strut Tech, or equal.
8. Anchor bolts and screws for attaching pipe supports and hangers to walls, floors, ceilings, and roof beams shall be Type 316 stainless steel, ASTM A 276 or F 593. Nuts shall be Type 316 stainless steel, ASTM A 194, Grade 8M, or ASTM F 594, Type 316 stainless steel.

J. Fabrication and Manufacture:

1. A union shall be provided within 2 feet of each threaded end valve unless there are other connections which will permit easy removal of the valve. Unions shall also be provided in piping at locations adjacent to devices or equipment which may require removal in the future and at locations required by the drawings or specifications.
2. Taps for pressure gauge connections on the suction and discharge of pumping units shall be provided with a nipple and a shutoff gauge cock.

2.03 ACCESSORIES (Not Applicable)

2.04 SPARE PARTS (Not Applicable)

2.05 QUALITY CONTROL

- A. Contractor shall follow Manufacturer's and Supplier's recommended product quality control specifics as required for this project.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

1. Unless noted otherwise, the sleeve and tubing method shall be used for all buried chemical piping. The sleeve and tubing method comprises rigid pipe as the containment sleeve with flexible chemical resistant tubing pulled through the sleeve as the carrier pipe.
2. Precast concrete junction boxes or polymer utility boxes shall be placed as shown on the Drawings to make tubing coupling connections and to provide a means of pulling the tubing through the sleeve. The boxes shall be coated with chemical resistant coating to protect the concrete from chemical attack in the event of a leak.
3. The rigid pipe sleeves shall slope continuously between boxes without dips and valleys so that leaks will drain to the boxes.
4. Tubing sections shall be coupled together inside the boxes only. Tubing shall be coiled inside each box to account for expansion and contraction. Coil radius shall be kept largest then the tubing manufacturer's recommended minimum radius.

5. Fiberglass reinforced plastic pipe supports shall be used to support tubing inside the boxes, however, coiled tubing shall be loosely secured to supports to allow longitudinal movement for expansion/contraction.

B. Pipe:

1. Pipe shall be installed as specified, and as indicated on the Drawings, or in the absence of detail piping arrangement, in a manner acceptable to the Owner and Engineer.
2. Pipe shall be cut from measurements taken at the site and not from the drawings. All necessary provisions shall be taken in laying out piping to provide for expansion and contraction. Piping shall not obstruct openings or passageways.
3. PVC pipe shall be kept shaded and shall be covered with backfill immediately after installation and testing.
4. All piping shall be installed so that lines are readily accessible for cleaning and repairing a new carrier tube. At changes in direction in all chemical piping, tees shall be provided with extra openings plugged to facilitate cleaning. Teflon thread tape or teflon thread sealer shall be applied to the threads of all plugs so that they can be easily removed.

C. Pipe Joints: Pipe joints shall be carefully and neatly made in accordance with the requirements which follow.

1. Threaded:
 - a. Pipe threads shall conform to ANSI 82.1, NPT, and shall be full and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall be reamed, after threading and before assembly, to remove all burrs.
 - b. Threaded joints in plastic piping shall be made up with teflon thread tape applied to all male threads.
2. Solvent Welded: All joint preparation, cutting and jointing operations shall comply with the pipe manufacturer's recommendations and ASTM D2855. Pipe ends shall be beveled or chamfered to the dimensions recommended by the manufacturer. Newly assembled joints shall be suitably blocked or restrained to prevent movement during the set time recommended by the manufacturer. Pressure testing of solvent welded piping systems shall not be performed until the applicable curing time, set forth in Table X2.1 of ASTM D2855, has elapsed.
3. Flanged: Flange bolts shall be tightened sufficiently to slightly compress the gasket and effect a seal, but not so tight as to fracture or distort the flanges. A plain washer shall be installed under the head and nut of bolts connecting

plastic pipe flanges. Anti-seize thread lubricant shall be applied to the threaded portion of all stainless steel bolts during assembly.

D. Pipe Sleeves:

1. Piping passing through or walls shall be installed through sleeves installed before the concrete is placed or when masonry is laid.
2. Unless otherwise indicated on the Drawings, all pipes passing through or below walls or slabs shall be sealed watertight with special rubber gasketed sleeve and joint assemblies or with sleeves and modular rubber sealing elements.
3. Buried pipe sleeves enclosing chemical-piping shall be sloped to the open end as indicated on the drawings to allow observation of leakage of the chemical piping. The upper end of each sleeve shall be sealed watertight.

3.03 INSPECTION AND TESTING

A. Pressure and Leakage Testing:

1. Both carrier and containment piping shall be pressure tested.
2. All specified tests shall be made by and at the expense of the Contractor in the presence, and to the satisfaction of, the Owner and Engineer. Each piping system shall be tested in accordance with Section 15044 - Pressure Testing of Piping, and at a minimum must experience no loss of pressure for at least one hour.
3. Leakage may be determined by loss of pressure, soap solution, chemical indicator, or other positive and accurate method acceptable to the Owner and Engineer. All fixtures, devices, or other accessories which are to be connected to the lines and which would be damaged if subjected to the specified test pressure shall be disconnected and ends of the branch lines plugged or capped as required during the testing procedures.
4. Drainage and venting systems shall be tested by filling with water to the level of the highest vent stack. Openings shall be plugged as necessary. Each system shall hold the water for 30 minutes without any drop in the water level.
5. All necessary testing equipment and materials, including tools, appliances and devices, shall be furnished and all tests shall be made by and at the expense of the Contractor and at such time as directed by the Owner and Engineer.
6. All joints in piping shall be tight and free from leaks. All joints which are found to leak by observation or during any specified test shall be repaired and tests repeated.

B. Cleaning:

1. The inside of all pipe, valves, and fittings shall be smooth, clean, and free from blisters, loose mill scale, sand, dirt, and other foreign matter when erected. The interior of all lines shall be thoroughly cleaned, to the satisfaction of the Engineer, before being placed in service.
2. Lines which have been flushed with water shall be air dried with compressed air immediately following drainage.

END OF SECTION

SECTION 15128

WET TAPS AND TEMPORARY LINE STOPS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The work included under this Section consists of work performed on pressurized pipelines by the approved wet tap and line stop method and the immediate installation of various piping, valves, and instrumentation in accordance with the Contract Documents.
- B. The Contractor shall take all safety measures necessary to prevent shutting down or active process piping and shall coordinate all work to accommodate the needs of the existing treatment facility operations. Interruptions to the facility's operations will not be permitted during wet tap or line stop activities; however, the Contractor shall notify the Owner in advance of such activities in accordance with Section 01041.

1.02 QUALITY ASSURANCE

- A. The Contractor shall employ the services of a wet tap and line stop specialist to perform wet taps and line stops as shown the Drawings and necessary in the completion of the work. The specialist shall be experienced in performing such work on potable water pipelines, and shall have previously performed at minimum of five (5) line stops of equal or greater size on potable water systems within the last five (5) years to be considered qualified for this project.
- B. Wet Tap and Line Stop Technician Qualifications:
 - 1. Wet tap and line stop technician actually operating the machinery shall have a minimum of five (5) years of continuous employment history with the wet tap and line stop specialist. The Contractor shall be required to furnish employment history for this technician along with a safety and other operational training summary.
- C. Potential wet tap and line stop specialists that may meet the qualifications requirements as noted above include the following:
 - 1. EA Services
 - 2. TDW Services
 - 3. International Flow Technologies
 - 4. Rangeline Tapping Services
 - 5. Or Equal.

1.03 SUBMITTALS

- A. Submit shop drawings in accordance with the Section 01340: Shop Drawings and Submittals and the following.
- B. Qualifications for the wet tap and line stop specialist, including representative projects and technician qualifications as required in paragraph 1.02, A and B above.
- C. Contractor shall submit a plan outlining the estimated schedule, method of construction and restoration of the wet taps and line stops. This shall include but is not limited to detailed drawings and a written description of the entire construction procedure to install, bypass, and reconnect the water main.
- D. Contractor shall submit certification of workmen training for installing wet taps and line stop fittings.
- E. Contractor shall provide submittals for all materials and equipment to be installed during the performance of the work.

1.04 PRODUCT, DELIVERY, STORAGE AND HANDLING

- A. If proposed or existing pipe and fittings become damaged before or during installation, it shall be repaired as recommended by the manufacturer or replaced as required by the Engineer or Owner at the Contractor's expense, before proceeding further.
- B. The Owner reserves the right to reject the work performed on any portion of the project in which there is evidence that the materials have not been handled in accordance with the manufacturer's recommendations.

1.05 WARRANTY AND GUARANTEES

- A. The Contractor is responsible for replacing any portion of the work found to be installed in a way that stresses the material beyond the manufacturer's recommendations.
- B. The Contractor shall provide all warranties and guarantees relative to workmanship and materials as required by the Contract Document, General Conditions and supplementary Conditions.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The equipment used in the installation of wet taps and line stops installation shall be of adequate commercial size and satisfactory working condition for safe operation and will be subject to approval by the Engineer. Such approval, however, will not relieve the Contractor of the responsibility for making a satisfactory installation satisfying all criteria of the project.

- B. The Contractor shall provide all materials for completing the installation and for adequate protection of the work.
- C. Line stop and wet tap minimum pressure rating shall be equal to that of the pipeline in which they are to be installed.

2.02 MANUFACTURER TESTING

- A. Test for compliance with this Specification shall be made as specified herein and in accordance with the applicable ASTM Specification. A certificate with this inspection shall be furnished upon request by the manufacture for all material furnished under this Specification. Equipment, valves, and fittings may be rejected if they fail to meet any requirements of this Specification.

2.03 FITTINGS

- A. The wet tap fitting to be used for this type work shall be manufactured in two sections. The back (bottom) section will be of the full encirclement type and conform to the measured pipe outside diameter. The front (top) section will also be full encirclement type with a factory installed nozzle and flange outlet. Wet tapping saddles shall be fabricated from approved carbon steel materials. The body run sections (top and bottom) shall be made of ASTM A-283 grade steel as a minimum. Steel run sections shall conform to and re-enforce the existing pipe.
- B. Fittings will have a recess for installation of a Buna-N rubber gasket around the hot tapping outlet. Bolts and nuts shall be a corrosion resistant alloy material per AWWA C-111 and ANSI 21.11.
- C. A ¾" female NPT threaded test outlet will be placed into the nozzle branch outlet, at the factory, for the purposes of site pressure testing after the fitting has been installed around the pipe.
- D. Outlets in sizes 4" to 60" in diameter shall have a minimum pressure rating of 150 psi.
- E. Body: ASTM A 283 grade C or ASTM A-36. Saddle plate thickness shall be in accordance with the design criteria for the entire fitting. The minimum wall thickness for saddle plates shall be 0.375". All welding of materials shall be in accordance with applicable code standards. Saddle plates shall be designed to permit longitudinal bolting of the top and bottom halves around the pipe.
- F. Hot Tap Nozzle: Nozzles attached to the saddle plates shall be constructed of A-106 Grade B steel or ASTM A-283 or A-36 steel. All weldments will be suitably stressed relieved when required by code or by common practice. Nozzle thickness shall be a minimum of standard steel pipe size or Schedule 40 pipe wall thickness in compliance with the maximum working pressure of the system.
- G. Nozzle to Pipe Sealing Gasket: Shall be molded from elastomeric compounds that resist compression set and are compatible with wastewater in the temperature range of 32 to 140 degrees F.

H. Flanges Used For Line Plugging

1. All flanges used for line plugging will be manufactured from ASTM- A-105 grade or equal.
2. Flanges will comply with ASME B16.5 in sizes up to 12". Completion plug locking mechanisms shall consist of ring segments or steel leaves that lock from or into the flange bore.

I. Point Loaded Set Screw: The use of point loaded set screw type locks shall be strictly prohibited.

J. Completion Plugs Used for Line Plugging: Completion plugs used for line plugging shall be manufactured from steel plate, ASTM A-36 grade material. Completion plugs shall be constructed in such a manner that an "O" ring pressure activated device will permit sealing the completion plug to the flange bore thus permitting the safe recovery of the temporary valve utilized for the line plugging operation. Locking grooves or locking leaves will be designed to meet the maximum working pressure of the system.

K. Blind Flanges: Blind flanges shall be steel grade ASTM A-181 or ASTM A-105 and mate with the line plugging. Minimum blind flange thickness shall comply with AWWA C-207.

L. Flange Gaskets

1. All gaskets shall be of non-asbestos composition and designed to mate to the inner bore and inner bolt circle of the line plugging flange.
2. All gaskets shall be .125" minimum thickness.

M. Fasteners: All external bolting, studs and nuts shall be made of 316 Stainless Steel.

N. Pressure Test Port: Each fitting shall be furnished with a factory supplied ¾" threaded test outlet and plug attached to the hot tap and stopple nozzle.

O. Finish: After completion of fabrication, all fittings shall be coated both internally and externally in accordance with Specification Section 09900.

2.04 EQUIPMENT

A. General: All equipment utilized for the wet tapping and line stop operations shall be designed and manufactured to meet the maximum working pressure of the system onto which they are to be used.

B. Wet Tapping Machinery:

1. Wet tapping machinery shall be designed and constructed to withstand the pressure and mechanical forces to be encountered during the wet tapping process. Equipment shall be power operated. The machinery utilized to perform each wet tap shall have a pressure tight chamber attached to the power rotation portion of the mechanism. The shell cutter utilized for the trepanning process shall have carbide or high strength carbon steel tips to insure a smooth cut. Shell cutter will be inspected by the Owner for sharpness prior to mounting the wet tap machine to the valve.
2. The pilot drill shall have a carbide or high strength carbon steel tip and inspected by the Owner. The drill shall be furnished with a "coupon catching" device to ensure that every precaution has been taken to recover the cut-out pipe section. Owner will inspect the coupon catching device. The use of threaded tip pilot drills that act as coupon catching devices is strictly prohibited. The Contractor shall demonstrate calculations that the catching mechanism is of sufficient strength to retain the weight of the cut-out pipe section.

C. Pipe Plugging Equipment: All equipment utilized for the pipe plugging operation shall be designed and manufactured to meet the maximum working pressures of the system.

D. Temporary Pipe Plugging Control Valve:

1. Temporary pipe plugging control valve shall be provided by the wet tapping Contractor along with a certificate of pressure test, at the factory, for the maximum pressures to be encountered while working on the pipe. All valves shall have a minimum bore that permits placement and removal of the factory supplied completion plug.
2. All temporary valves shall be provided and returned upon project completion.

E. Pipe Plugging Machinery:

1. The pipe plugging machinery shall consist of an actuator attached to a pressure tight housing. Contained within the pressure tight housing shall be a plugging head with an elastomeric seal captured between steel plates. The design and operation of the plugging head and sealing element shall meet the maximum pressures to be encountered in the water system. The sealing element shall be manufactured of elastomeric material and be non-toxic. The use of a vegetable base lubricant shall be mandatory for placement of the sealing element into the pipe system.
2. Pipe plugging equipment shall be provided with a flanged outlet on the plugging head housing. The plugging machine flanged outlet shall permit the Contractor to provide and install a temporary by-pass pipe system between the two plugging machines thus facilitating the maintenance of constant service while the primary pipe system under goes alterations.

- F. Purge and Equalization: Pipe plugging requires the use of an ancillary fitting for depressurization of the pipe system after the pipe plugging head has been placed into the system. The purge and equalization fitting is used to insure the integrity of the pipe plugging mechanism, to insure no other valves in the system might be open or not holding and to safely depressurize and pump the liquid out of the main prior to modification. This fitting is also required to introduce pressure into the pipe system after alterations are completed. The pipe system pressure must be equalized on both sides of the plugging head to permit its removal from the system. Wherever possible, existing connections shall be used for this purpose. When existing fittings are not available, then the tapping Contractor will provide a completion type fitting for this purpose.

PART 3 - EXECUTION

3.01 FITTING INSTALLATION

- A. Fitting Field Installation: Fittings shall be installed in accordance with the manufacturer's recommendation. In no case shall the fitting be retrofitted while it is on the pipe. Any adjustments in fitting installation will require the Contractor to remove the fitting from the pipe and make Engineer and Owner approved alterations.
- B. Suggested Installation Instructions: Cast Iron or Ductile Iron Pipe
1. Pipe Preparation: The pipe shall be excavated at the location indicated on the plans and specifications. Excavation shall be in accordance with current O.S.H.A safety standards. Excavation shall include necessary sheeting and shoring, gravel base and site de-watering. Proper pipe support and thrust restraint shall be in place prior to the start of wet tap saddle installation. The pipe shall be thoroughly cleaned down to the factory supplied outside diameter. The pipe shall be carefully inspected, especially at the point where the fitting "O" ring must seal to the pipe surface. Any surface pitting shall be filled in with an Engineer approved epoxy or the site moved to an acceptable location.
 2. Installation: The bottom half of the fitting shall be placed around the pipe first and properly supported from the bottom of the pipe with wood cribbing. The top half of the fitting shall have the O-ring seal lightly lubricated with vegetable base grease and then place upon top of the pipe. Side seam draw bolts shall be installed and the fitting halves shall be uniformly drawn together, in a loose fashion, starting from the center and working out to each end. The flange will be plumbed using a spirit level. Once the outlet flange is plumb, the sides of the fitting shall draw together until the O-ring is compressed against the pipe surface. The use of a feeler gauge may be used to determine "O" ring compression.
 3. Pressure Testing: A blind flange shall be attached to the fitting flange outlet and a suitable pressure test applied to check the contoured elastomeric O-ring seal.

After successful pressure test, the blind flange shall be removed. The field pressure test shall not exceed the internal line pressure.

4. Concrete Encasement and Thrust Restraint: After acceptance of the pressure test, concrete support and thrust restraint shall be placed around the fitting and pipe joints to properly support the pipe, including equipment weights, and to prevent lateral movement of the pipe joints when the system is altered downstream of the line stopping process. The size and length of the concrete support shall be based upon the Contractor's calculation and existing site, pressure and soil conditions.

3.02 FIELD PROCEDURES

- A. Field procedures for wet taps and line stops shall be performed in accordance with the best practices for such work. An example of field procedures for cast iron and ductile iron pipe is provided below to establish the level of effort anticipated. A project specific field procedure shall be submitted with the work plan noted in paragraph 1.03, C above.
 1. Contractor shall provide a safe work environment in accordance with current OSHA Standards.
 2. Contractor shall excavate, expose and clean the outer surface of the main so that the pipe to be tapped or plugged can be measured by a caliper and tape measure prior to manufacture of the required special fitting.
 3. The Contractor shall be responsible for proper pipe support and the excavation will be in compliance with current O.S.H.A. safety standards.
 4. Pipe plugging fitting drawings shall be prepared and submitted for approval Engineer and Owner prior to manufacture.
 5. The Contractor shall properly install the fitting in accordance with the manufacturer's recommendations. After installation, the fitting shall be suitably pressure tested.
 6. After fitting installation, the Contractor shall provide sufficient concrete support under and around each fitting based upon existing soil conditions, the size and weight of the equipment to be mounted to the fitting, and anticipated lateral thrust that shall be placed on the fittings and pipe sections at the time of the pipe plugging operations and main line alterations. Lateral thrust restraint is required. The Contractor shall also take into consideration the lateral thrust that shall be placed on the pipe and plugging fitting at the time work is to be performed downstream of the line stops. The Contractor shall provide thrust forces on the fitting and equipment based upon operating pressures of the system.

7. Concrete shall reach minimum cure strength as specified by the Engineer prior to the mounting of any tapping-plugging machinery. The use of concrete additives to speed the cure time shall be used with the approval of the Engineer.
8. Upon acceptance of concrete support and thrust cure process, the Contractor shall provide and install the temporary control valve on to the plugging fitting.
9. The wet tap will be performed and the cut out pipe section (coupon) will be retracted into the tapping machine's pressure housing. The temporary control valve shall be closed, the tapping machine de-pressurized and removed from the temporary control valve.
10. Wet tap technician shall be required to furnish, to the Owner, written calculations for the wet tap and line stop operation. The written calculation shall include pilot drill travel, location of the pilot drill keeper wires in relation to the severed coupon and wet tap shell cutter travel. Wet tap machine shall be provided with a positive travel measurement device and all calculations shall be verified by the Owner prior to the start of the tap. Plugging head sealing element sizing data and plugging head travel calculations shall be provided in a written format. Completion plug setting calculations shall also be required.
11. Once the wet tap machine has been attached to the valve, the wet tap pilot drill shall be advanced to the pipe face by hand. Travel calculations will be checked in relation to the previous recorded data. Once the pilot drill has penetrated the pipe wall, the wet tap machine shall be shut down and all joints inspected for leaks. The wet tap process shall be continued to the pre-determined cut completion calculation. The machine shall be shut down and the cutting head retracted by hand back to the start measurement.
12. The coupon shall be removed from the wet tap machine and the coupon shall be measured for the purpose of verification of the pipeline stop sealing element.
13. Installation of Temporary By-Pass Line Applications
 - a. Contractor shall connect temporary by-pass line to each flange connection on each stopple machine housing.
 - b. The temporary control valve(s) shall be opened and the plugging head(s) will be inserted to the measured and calculated distance into the main line.
14. The downstream plugging head shall be placed into the system first. Once the line plugging head is seated in the main, the system will be de-pressurized downstream of the plugging head using the special purge fitting provided for that purpose, or through existing system connections.

15. De-pressurization shall be in accordance with the below listed fitting sizes based upon the main size being plugged:
 - a. Main size 4" to 20" 2"
 - b. Main size 22" to 48" 4"
 - c. Main size 54" and larger 6" minimum
16. Once de-pressurization is confirmed then the Contractor may perform alterations to the pipe system as specified.
17. Upon termination of pipe alterations, the pipe system shall be re-sealed and pressure will be introduced into the section of the pipe that has been modified.
18. With system pressure equalized on both sides of the plugging head(s), the plugging head(s) shall be removed from the pipe system and retracted back into the pressure housing on the plugging machine(s). The temporary control valve shall be closed and the line plugging machine de-pressurized and removed from the temporary control valve.
19. Removal of Temporary By-Pass Line Applications
 - a. After the plugging head(s) are removed from the pipeline and the control valve(s) are closed the Contractor shall drain the temporary by-pass line and remove it from the stopple machine(s).
 - b. A completion machine shall have the completion plug mounted to the tool holder and the completion plug O-ring will be lubricated with vegetable-based grease. The completion machine will be installed on the temporary control valve and the valve opened.
20. The completion plug shall be lowered to the pre-measured distance into the special flange on the line plugging fitting. The completion plug shall be securely locked into position and verified locked by the hot tap field technician.
21. The completion machine shall be disconnected from the completion plug tool holder, the machine depressurized to confirm the plug is secure and holding. The completion machine shall be removed from the temporary control valve.
22. The temporary control valve will be removed from the plugging fitting and a gasket and blind flange will be installed on the plugging fitting.

END OF SECTION

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DIVISION 16

ELECTRICAL

SECTION 16050

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: General administrative, procedural requirements, and installation methods for electrical installations specified in Division 16.
- B. The Drawings are schematic and are not intended to show every detail of construction.
 - 1. In general, conduits/raceways, transitions and offsets shown on Drawings indicate approximate locations in plan and elevation where the systems are intended to be run.
 - 2. CONTRACTOR shall fully coordinate electrical Work with other trades to avoid interferences.
 - 3. In the event of interferences, CONTRACTOR shall request clarification from ENGINEER in writing.
- C. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Sections, apply to Work of this Section.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with requirements of Section 01340, Shop Drawings covering the items included under this Section of Work. Shop Drawing submittals shall include:
 - 1. Submit product data covering the items included under this Section of Work.
- B. Conforming to Construction Drawings: Submit a complete set of Drawings showing the locations of the piping, ductwork, etc., as actually installed. Such Drawings shall be submitted to ENGINEER in electronic format (PDF).
- C. Operation and Maintenance Manuals: Submit in accordance with requirements of Section 01600, operation and maintenance manuals for items included under this Section. Include following information for equipment items:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.

2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.

1.03 RECORD DOCUMENTS

- A. Prepare Record Documents in accordance with requirements in Section 01780. In addition, CONTRACTOR shall submit, prior to final payment, Drawings conforming to construction records of systems it has installed. Vendor drawings shall be sized as manufacturers' standard.
- B. Provide typewritten data sheets on motor control circuits with following information on each branch feeder: Load name, horsepower or KVA (transformer), fuse size, starter size, service factor of motor, motor nameplate currents, power factor correction capacitor size (if used), and thermal overload part number.

1.04 QUALITY ASSURANCE

- A. National Electrical Code: Comply with NFPA 70, National Electrical Code.
- B. UL Compliance and Labeling: Use products and components labeled by UL.

1.05 PERMITS, INSPECTIONS, AND LICENSES

- A. CONTRACTOR shall procure all necessary permits and licenses, observe and abide by all applicable laws, codes, regulations, ordinances, and rules of the State, territory, or political subdivision thereof, wherein Work is done, or any other duly constituted public authority, and further agrees to hold OWNER harmless from liability or penalty which might be imposed by reason of an asserted violation of such laws, codes, regulations, ordinances, or other rules.
 1. Upon completion of Work, CONTRACTOR shall secure certificates of inspection from the inspector having jurisdiction and shall submit 3 copies of the certificates to OWNER. CONTRACTOR shall pay the fees for the permits, inspections, licenses, and certifications when such fees are required.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification. Equipment

shall be packaged to prevent damage during shipment, storage, and handling. Do not install damaged units; replace, and remove damaged units from Site.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL ELECTRICAL INSTALLATION

- A. Provide electrical materials and equipment enclosures appropriate for areas in which they are installed. Each area will be designated on Drawings with a type of construction such as NEMA 4, 4X, 7 or 9 if it is other than NEMA 12. An area designated by a name and elevation includes space bounded by floor, ceiling, and enclosing walls.
 - 1. Exception: Provide manufacturer's standard construction for indoor or outdoor application where equipment is not manufactured to NEMA specifications (e.g., switchgear, transformers, high voltage capacitors, bus duct, and light fixtures; materials and equipment used in finished areas such as offices, laboratories, etc.).
- B. Provide nonmetallic electrical materials and equipment enclosures in NEMA 4X areas; watertight NEMA 4 and equipment enclosures for outdoor applications and indoor applications below grade; explosion-proof NEC Class I, Division 1, Group D equipment for NEMA 7 areas; explosion-proof NEC Class II, Division 2, Group F equipment for NEMA 9 areas.
- C. Provide chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
- D. Supporting devices and sleeves shall be set in poured-in-place concrete and other structural components as they are constructed.
- E. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide maximum headroom possible. Locate light fixtures at approximately 8 feet above floor and where fixtures may be readily serviced.
- F. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- G. Install systems, materials, and equipment to conform with approved submittal data, including coordination Drawings, to greatest extent possible. Conform to arrangements indicated by Drawings recognizing that portions of Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to ENGINEER.

- H. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components where installed exposed in finished spaces.
- I. As much as practical, connect equipment for ease of disconnecting with minimum of interference with other installations.
- J. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.02 RACEWAY INSTALLATION

- A. Outdoors, use the following materials:
 - 1. Exposed Conduit: Rigid metal conduit and fittings.
 - 2. Underground Direct Buried Conduit: Rigid nonmetallic conduit.
 - 3. Underground Concrete Encased Conduit: Rigid nonmetallic conduit.
 - 4. Conduit Used to Connect to Vibrating Equipment including transformers and hydraulic, pneumatic or electric solenoid or motor-driven equipment: Liquidtight flexible metal conduit.
- B. Indoors, use the following wiring materials:
 - 1. Connection to Vibrating Equipment, including transformers and hydraulic, pneumatic or electric solenoid or motor-operated equipment: Liquidtight flexible metal conduit.
 - a. Exception: NEMA 7 or 9 areas require explosion-proof flexible conduit.
 - 2. Exposed Conduit: Rigid metal conduit.
 - a. Exceptions:
 - i. Areas indicated as NEMA 4X, use rigid Schedule 80 PVC conduit.
 - ii. Areas indicated as NEMA 7 or NEMA 9 (such as grit and raw sewage rooms), use PVC externally coated rigid steel conduit.
 - 3. Concealed Conduit: Rigid metal conduit.
- C. Minimum size conduit shall be 3/4 inch unless shown otherwise.
- D. Instrument Signal Conduit Requirements: Shielded signal wires for 4-20 mA type instruments or thermocouple wires assigned to the same control panel may be run in the same conduit. Shielded instrument signal wires, thermocouple wires, and shielded 2-wire intercom wires may be run in the same conduit. No other wires will be permitted in an instrument signal/2-wire intercom conduit. Conduit shall be RMC.

- E. Conduit Thread Paint: Make threaded conduit joints watertight by coating threaded portions with a spray-on or brush-on zinc-bearing paint. Provide paint containing 90 percent minimum by weight of metallic zinc powder in the dried film. Clean field-cut threads of oil using the recommended solvent prior to coating threads.
- F. Install expansion fittings in all exposed rigid nonmetallic conduit runs of 20 feet or more.
- G. Install expansion/deflection fittings where conduit passes a building expansion joint or where conduits are attached to two structures joined by a concrete expansion joint.
- H. Exposed or Concealed Construction: Install conduit exposed inside buildings except for areas with finished walls (e.g., offices, laboratories, lavatories, locker rooms, etc.) unless otherwise indicated.
- I. Concealed Raceways: Raceways embedded in slabs shall be installed in the middle third of the slab thickness where practical and leave at least 1-inch concrete cover. Tie raceways to reinforcing rods or otherwise secure them to prevent sagging or shifting during concrete placement. Space raceways laterally to prevent voids in the concrete. Run 1-inch and smaller raceways with a minimum of bends in the shortest practical distance. Run larger conduit parallel with or at right angles to the main reinforcement; where at right angles to the reinforcement, the conduit shall be close to one of the supports of the slab. Where nonmetallic conduit or fiberglass-reinforced conduit is used, raceways must be converted to PVC externally coated rigid metal conduit before rising above floor.
- J. Exposed Raceways: Install parallel and perpendicular to nearby surfaces or structural members and follow the surface contours as much as practical. Make bends and offsets so the inside diameter is not effectively reduced. Keep the legs of a bend in the same plane and the straight legs of offsets parallel. Conduits shall slope away from loads to keep moisture from entering the load. Run parallel or banked raceways together. Make bends in parallel or banked runs from the same centerline so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run, such as from wall to ceiling and that the raceways be of the same size. In other cases, provide field bends for parallel raceways. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.
- K. Space raceways, fittings, and boxes 0.25 inch from mounting surface in NEMA 4 and NEMA 7 areas. Spacers shall be one-piece construction of stainless steel, galvanized steel, PVC, ABS, or other noncorrosive material.
- L. Sleeves: Install in concrete floor slabs except where conduit passes through a housekeeping pad. Install in exterior walls below grade.
- M. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid metal conduit; flexible metal conduit may be used 6 inches above the floor. Where equipment

connections are not made under this Contract, install screwdriver-operated threaded flush plugs with floor.

- N. Flexible Connections: Use short length (maximum 6 feet for lighting fixtures; maximum 3 feet for all other equipment) of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement, and all motors. Use liquidtight flexible conduit in wet locations and rated flexible connections for hazardous locations. Install separate ground conductor across flexible connections.
- O. Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.
- P. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For intermediate metal conduit, use threaded rigid metal conduit fittings. For PVC externally coated rigid metal conduit, use only factory-coated fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduit.
- Q. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL listed sealing compound. For concealed raceways, install each fitting in a flush metal box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:
 - 1. Where conduits enter or leave hazardous locations.
 - 2. Where conduits enter or leave NEMA 4X areas.
 - 3. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
 - 4. Where required by the NEC.
- R. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- S. Install device boxes at the height above the floor as follows for:
 - 1. Light switches, 4 feet.
 - 2. Receptacles and telephone jacks, 18 inches except in NEMA 4 and 4X areas, 4 feet.
 - 3. Thermostats, 4'-0".

- T. Position recessed outlet boxes accurately to allow for surface finish thickness.
- U. Fasten electrical boxes firmly and rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete masonry.
- V. Provide fire-retardant barriers in all pull and junction boxes containing circuits that are otherwise continuously separated in conduit. Securely fasten these barriers within box. Size barriers so that space between barrier and box wall does not exceed 0.125 inch anywhere around the perimeter of barrier.
- W. Support exposed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
- X. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from building structure.
- Y. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box and tighten the chase nipples so no threads are exposed.
- Z. Complete installation of electrical raceways before starting installation of conductors within raceways and prevent foreign matter from entering raceways by using temporary closure protection. Cap spare conduit. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- AA. Install pull wires in empty raceways: Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-pound tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.

3.03 WIRE AND CABLE INSTALLATION

- A. Use pulling means including fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant where necessary.
- B. Keep branch circuit conductor splices to minimum. Splice feeders only where indicated. Use a standard kit. No splices are allowed for instrument and telephone cables except at indicated splice points.

- C. Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced. Use splice and tap connectors which are compatible with conductor material and are UL listed as pressure type connectors.
- D. Provide adequate length of conductors within electrical enclosures and train conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than No. 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at terminal.
- E. Terminate power conductors at equipment using pressure-type terminals specifically designed for type of terminations to be made. Terminate no more than 2 conductors No. 8 AWG and smaller within the same pressure-type terminal. These 2 conductors shall be no more than 4 wire gauge sizes apart. Terminate no more than 1 conductor larger than No. 8 AWG within any pressure-type terminal.
 - 1. Exception: Power factor correction capacitor conductors may be terminated at the motor disconnect switch load terminals.
- F. Seal wire and cable ends until ready to splice or terminate.

3.04 CUTTING AND PATCHING

- A. Perform cutting and patching in accordance with requirements in Section 01730. In addition, the following requirements apply.
 - 1. Perform cutting, fitting, and patching of electrical equipment and materials required to uncover Work to provide for installation of ill-timed Work, remove and replace Work that is either defective or does not conform to requirements of Drawings.
 - 2. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated including, but not limited to, removal of electrical items indicated to be removed and items made obsolete by new Work. Protect structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed. Provide and maintain temporary partitions or dust barriers adequate to prevent spread of dust and dirt to adjacent areas.
 - 3. Patch existing finished surfaces and building components using new materials matching existing materials.

3.05 EQUIPMENT CHECKOUT AND TESTING

- A. In addition to testing recommended by equipment or material supplier and called for in equipment or material specification, perform the following.
- B. Equipment Testing: The following tests which are applicable for a particular item of equipment shall be performed:

1. Megger bus work phase-to-phase and phase-to-ground. Minimum acceptable steady-state value is 100 megohms.
 2. Megger power circuit breakers and circuits supplied phase-to-phase and phase-to-ground (100 megohms minimum).
 3. Test current transformer circuits by applying current to secondary wiring at current transformer terminals until contactor trips.
 4. Test, time, and set protective relays. Relays shall be timed at various multiples (minimum of 3 points) of the pick-up value to determine agreement with published curves and adjust as necessary to agree with coordination study required settings. Exact tests to be performed vary with type of relay. Manufacturer's instructions for relay shall be complied with.
 5. After Work has been completed, demonstrate to OWNER's Representative that entire electrical installation is in proper working order and will perform functions for which it was designed by functional testing.
 6. Make any specific tests required by the manufacturer's installation instructions.
- C. Check-out Procedures. In general, check-out procedures (as listed below) which are applicable for a particular item of equipment shall be performed:
1. Vacuum interior of cubicles and remove foreign material.
 2. Wipe clean with a lint-free cloth insulators, bushings, bus supports, etc.
 3. Check and adjust time delay, under-voltage devices, phase relay, over-current relays, etc., as required by coordination study or ENGINEER.
 4. Fill motor bearings requiring oil.
 5. Check and change, as required, thermal overload heater elements to correspond with motor full-load current and service factors of installed motor.
 6. Check direction of rotation of motors and reverse connections if necessary. Check rotation with motor mechanically uncoupled where reverse rotation could damage equipment.
 7. Equipment with two or more sources of power connected by tie breakers, transfer switches, or generator receptacles shall be checked for rotation from each possible combination of power sources. Power sources must have the same phase sequence for each source throughout entire facility.
 8. Check exposed bolted power connections for tightness.
 9. Check operation of breakers, contactors, etc., and control and safety interlocks.

10. Check tightness of bolted structural connections.
11. Check leveling and alignment of enclosures.
12. Check operating parts and linkages for lubrication, freedom from binding, vibration, etc.
13. Check tightness and correctness of control connections at terminal blocks, relays, meters, switches, etc.
14. Clean auxiliary contacts and exposed relay contacts after vacuuming.

END OF SECTION

SECTION 16060

GROUNDING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Electrical grounding and bonding Work as follows:
 - 1. Solidly grounded.
- B. Applications of electrical grounding and bonding Work in this Section:
 - 1. Underground metal piping.
 - 2. Underground metal water piping.
 - 3. Underground metal structures.
 - 4. Electrical power systems.
 - 5. Grounding electrodes.
 - 6. Separately derived systems.
 - 7. Raceways.
 - 8. Enclosures.
 - 9. Equipment.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product Data: Submit manufacturer's data on grounding and bonding products and associated accessories.

1.03 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. UL Compliance: Comply with applicable requirements of UL Standards No. 467, "Electrical Grounding and Bonding Equipment," and No. 869, "Electrical Service Equipment," pertaining to grounding and bonding of systems, circuits, and equipment. In addition, comply with UL Standard 486A, "Wire Connectors and

Soldering Lugs for Use with Copper Conductors." Provide grounding and bonding products which are UL listed and labeled for their intended usage.

2. IEEE Compliance: Comply with applicable requirements and recommended installation practices of IEEE Standards 80, 81, 141, and 142 pertaining to grounding and bonding of systems, circuits, and equipment.

PART 2 - PRODUCTS

2.01 GROUNDING AND BONDING

A. Materials and Components:

1. Except as otherwise indicated, provide electrical grounding and bonding systems indicated; with assembly of materials including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for complete installation. Where more than one type component product meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products which comply with NEC, UL, and IEEE requirements and with established industry standards for those applications indicated.
2. Conductors: Electrical copper grounding conductors for grounding system connections that match power supply wiring materials and are sized according to NEC.
3. Ground Bus: 0.25 inch by 1 inch minimum copper ground bus where indicated.
4. Grounding Electrodes: Steel with copper welded exterior, 3/4-inch diameter by 10 feet.
5. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type services indicated.

PART 3 - EXECUTION

3.01 INSTALLATION OF ELECTRICAL GROUNDING AND BONDING SYSTEMS

- A. Connect grounding conductors to underground grounding electrodes using exothermic weld process or mechanical compression type connectors.
- B. Ground electrical service system neutral at service entrance equipment to grounding electrodes.

- C. Ground each separately derived system neutral to effectively grounded metallic water pipe, effectively grounded structural steel member, and separate grounding electrode.
- D. Connect together system neutral, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.
- E. Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug, bus, or bushing.
- F. Connect grounding electrode conductors to 1-inch diameter or greater, metallic cold water pipe using a suitably sized ground clamp. Provide connections to flanged piping at street side of flange.
- G. Connect building reinforcing steel, building steel beam, building steel roof and walls and duct bank and vault reinforcing steel to ground mat using No. 4/0 AWG bare copper grounding cable.
- H. Bond bare No. 4/0 AWG grounding cable in duct banks to grounding cable in vaults and to power equipment ground bus at ends of each duct bank.
- I. Bond strut and other metal inside of electrical manholes and vaults to bare No. 4/0 AWG grounding cable carried in duct bank.
- J. Bond grounding cables to both ends of metal conduit or sleeves through which such cables pass.
- K. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque-tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.
- L. Install braided type bonding jumpers with code-sized ground clamps on water meter piping to electrically bypass water meters.
- M. Route grounding connections and conductors to ground and protective devices in shortest and straightest paths as possible while following building lines to minimize transient voltage rises. Protect exposed cables and straps where subject to mechanical damage.
- N. Apply corrosion-resistant finish to field connections, buried metallic grounding and bonding products, and places where factory applied protective coatings have been destroyed and are subjected to corrosive action.

3.02 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester using the 3-point fall of potential method.

Testing shall be performed during normal dry weather conditions with at least 5 non-rain days elapsing prior to test. Where tests show resistance-to-ground is over 5 ohms, take appropriate action to reduce resistance to 5 ohms or less by driving additional ground rods; then retest to demonstrate compliance.

- B. Test ground paths for continuity by applying a low DC voltage source of current, capable of furnishing up to 100 amps, between electrical equipment grounds and ground grid. Grounding path must conduct a 100-amp current at a resistance of 0.010 ohms or less as calculated from circuit voltage.

END OF SECTION

SECTION 16070

SUPPORTING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product data for each type of product specified.

1.03 QUALITY ASSURANCE

- A. Electrical components shall be listed and labeled by UL, ETL, CSA, or other approved, nationally recognized testing and listing agency that provides third-party certification follow-up services.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Slotted Metal Angle and U-Channel Systems:
 - a. Allied Tube & Conduit.
 - b. American Electric.
 - c. B-Line Systems, Inc.
 - d. Cinch Clamp Co., Inc.
 - e. GS Metals Corp.
 - f. Haydon Corp.
 - g. Kin-Line, Inc.
 - h. Unistrut Diversified Products.

2. Conduit Sealing Bushings:
 - a. Bridgeport Fittings, Inc.
 - b. Cooper Industries, Inc.
 - c. Elliott Electric Mfg. Corp.
 - d. GS Metals Corp.
 - e. Killark Electric Mfg. Co.
 - f. Madison Equipment Co.
 - g. L.E. Mason Co.
 - h. O-Z/Gedney.
 - i. Producto Electric Corp.
 - j. Raco, Inc.
 - k. Red Seal Electric Corp.
 - l. Spring City Electrical Mfg. Co.
 - m. Thomas & Betts Corp.

2.02 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be protected with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors, in NEMA 4 areas, or embedded in concrete shall be Aluminum or 316 stainless steel.

2.03 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners. Types, materials, and construction features as follows:
 1. Expansion Anchors: Carbon steel wedge or sleeve type.
 2. Toggle Bolts: Steel springhead type.
 3. Hanger Rods: 0.375-inch diameter minimum, steel.

- C. Conduit Sealing Bushings: Factory fabricated, watertight conduit sealing bushing assemblies suitable for sealing around conduit or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable iron casting with hot-dip galvanized finish.
- E. U-Channel Systems: 12 gauge or 0.105-inch-thick steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center in top surface. Provide fittings and accessories that mate and match with U-channel and are of same manufacturer.

2.04 FABRICATED SUPPORTING DEVICES

- A. Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- C. Pipe Sleeves: Provide a waterstop on pipe sleeves. Provide pipe sleeves of 2 standard sizes larger than conduit/pipe passing through it and of one of the following:
 - 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gauge metal for sleeve diameter noted:
 - a. 3-inch and smaller: 20-gauge.
 - b. 4-inch to 6-inch: 16-gauge.
 - c. Over 6-inch: 14-gauge.
 - 2. Steel Pipe: Fabricate from Schedule 40 aluminum or stainless steel pipe.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including, but not limited to, the following:
 - 1. Buried electrical line warnings.
 - 2. Identification labeling for cables and conductors.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product Data for each type of product specified.

PART 2 - PRODUCTS

2.01 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Colored Adhesive Marking Tape for Wires and Cables: Self-adhesive, vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.
- B. Pre-tensioned Flexible Wraparound Colored Plastic Sleeves for Cable Identification: Flexible acrylic bands sized to suit raceway diameter and arranged to stay in place by pre-tensioned gripping action when coiled around the cable.
- C. Underground Line Marking Tape: Permanent, bright colored, continuous printed, plastic tape compounded for direct-burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.
- D. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with pre-printed numbers and letter.
- E. Aluminum, Wraparound Cable Marker Bands: Bands cut from 0.014-inch-thick aluminum sheet, fitted with slots or ears for securing permanently around wire or cable jacket or around groups of conductors. Provide for legend application with stamped letters or numbers.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification Work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by Code.
- B. Underground Electrical Line Identification: During trench backfilling for exterior nonconcrete encased underground power, signal, and communications lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench, do not exceed an overall width of 16 inches; install a single line marker.
- C. Install line marker for underground wiring, both direct buried and in raceway.
- D. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the Project secondary electrical system following OWNER's method of phase identification or as follows:
- E. Wiring Standards:
 - 1. 480/277 Volt, 3-Phase Power:
 - a. Brown.
 - b. Orange.
 - c. Yellow.
 - d. Grey Neutral.
 - 2. 208 Volt, 3-Phase Power:
 - a. Black.
 - b. Red.
 - c. Blue.
 - 3. 240/120 Volt, 1-Phase Power:
 - a. Black.
 - b. Red.
 - c. White Neutral.

4. Motor Leads, Control Cabinet/MCC:
 - a. Black, numbered L1-T1, etc.
5. Control Wiring:
 - a. Red Control circuit wiring that is de-energized when the main disconnect is opened.
 - b. Yellow Control circuit wiring that remains energized when the main disconnect is opened.
 - c. Blue DC.
 - d. Green Ground.
- F. Use conductors with color factory applied entire length of conductors except as follows:
 1. The following field applied color coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
 - a. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last 2 laps of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.
 - b. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply 3 ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.
- G. Power Circuit Identification: Securely fasten identifying metal tags of aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms with 1/4-inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-pound test monofilament line or one-piece self-locking nylon cable ties.
- H. Install wire/cable designation tape markers at termination points, splices, or junctions in each circuit. Circuit designations shall be as indicated on Drawings.

END OF SECTION

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SECTION 16120

WIRES AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Low-Voltage Wire and Cable.
 - 2. Instrument Cable.
 - 3. Local Area Network Wiring (LAN).

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Include Shop Drawings of wires, cables, connectors, splice kits, and termination assemblies.
- B. Reports of field tests prepared as noted in Section 01600.

1.03 QUALITY ASSURANCE

- A. UL Compliance: Provide components which are listed and labeled by UL. For cables intended for use in air handling space comply with applicable requirements of UL Standard 710, "Test Method for Fire and Smoke characteristics of cables used in Air Handling Spaces."
- B. NEMA/ICEA Compliance: Provide components which comply with following standards:
 - 1. NEMA WC 70-1999/ICEA S-95-658-1999, Nonshielded Power Cables Rated 2,000 Volts or Less for the Distribution of Electrical Energy.
- C. IEEE Compliance: Provide components which comply with the following standard.
 - 1. Standard 82, Test procedures for Impulse Voltage Tests on Insulated Conductors.
- D. Network Wiring Experience: CONTRACTOR must be able to prove to the satisfaction of OWNER that it has significant experience in the installation of Local Area Network cable systems. Installation must include installation of Network cable, cable termination, knowledge of interconnect equipment, and a thorough knowledge of testing procedures.
- E. Labeling: Handwritten labels are not acceptable. All labels shall be machine printed on clear or opaque tape, stenciled onto adhesive labels, or typewritten onto adhesive labels.

The font shall be at least 1/8 inch in height, block characters, and legible. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the font color shall contrast with the background. Patch panels shall exhibit workstation numbers or some type of location identifier, in sequential order, for all workstations or devices attached. Each Network cable segment shall be labeled at each end with its respective identifier.

- F. Network Wiring Interconnect Equipment (Patch Panels): Interconnect equipment shall be used in all Local Area Network cable installations. Patch panels shall be mounted in the equipment racks or panel mounted. Interconnect equipment mounted in racks shall be affixed to the rack by at least 4 screws. All interconnect devices shall be assembled and installed in accordance with the manufacturer's instructions and recommendations.
- G. Patch Cords: Patch cords shall be provided for each Local Area Network port on the patch panel. Patch cords shall meet or exceed technical specifications of all installed Local Area Network cable. Patch cord connectors shall be matched with patch panel connector type and network module connector type as required.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Low-Voltage Wire and Cable:
 - a. American Insulated Wire Corp.
 - b. General Cable.
 - c. The Okonite Co.
 - d. Southwire Co.
 - 2. Connectors for Low-Voltage Wires and Cable Conductors:
 - a. AMP.
 - b. O-Z/Gedney Co.
 - c. Square D Company.
 - d. 3M Company.
 - 3. Instrument Cable:
 - a. Belden (Trade Nos. 1120A and 1118A).

- 4. Local Area Network Cable:
 - a. Belden 7882A/7883A, or equal.

2.02 LOW-VOLTAGE WIRES AND CABLES

- A. Conductors: Provide stranded conductors conforming to ASTM Standards for concentric stranding, Class B. Construction of wire and cable shall be single conductor (1/c) unless multiconductor cable is shown by notation in form (x/c) where x indicates the number of separate insulated conductors per cable.
- B. Conductor Material: Copper. Minimum size power wire shall be No. 12 AWG.
- C. Insulation: Provide XHHW, insulation for power conductors used in single- and 3-phase circuits with more than 120 volts to ground. Provide XHHW, or THWN/THHN insulation for power conductors used in single- and 3-phase circuits with 120 volts or less to ground
 - 1. Provide THHN/THWN, or XHHW insulation for grounding conductors installed in raceways.
 - 2. Provide THHN/THWN insulation for control conductors.

2.03 CONNECTORS FOR LOW-VOLTAGE WIRES AND CABLES

- A. Provide UL listed factory fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types, and classes for applications and services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

2.04 INSTRUMENT CABLE

- A. Instrument Cable: 600-volt minimum insulated shielded cable with two or more twisted No. 16 or No. 16AWG stranded copper conductors; PVC, nylon, or polyethylene outer jacket; and 100 percent foil shielding.

2.05 LOCAL AREA NETWORK CABLE

- A. Category 6 (Ethernet) Data and Patch Cable:
 - 1. Paired, 4-pair, 24 AWG, solid bare copper conductors with polyethylene insulation, overall aluminum foil-polyester tape shield with 24 AWG stranded tinned copper drain wire, 100 percent shield coverage, PVC jacket.
 - 2. UL verified to Category 6.
 - 3. Provide plenum rated cable where installed exposed.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Local Area Network (LAN) Cable Tests: Testing of all cable segments shall be completed in compliance with EIA/TIA-568-B.1 Standards. Testing shall be done by CONTRACTOR with at least 5 years of experience in testing Network cabling systems.
1. TESTING: CONTRACTOR shall test each network cable segment. **OWNER reserves the right to have representation present during all or a portion of the testing process. CONTRACTOR must notify OWNER 5 days prior to commencement of testing.** If OWNER elects to be present during testing, test results will only be acceptable when conducted in the presence of OWNER.
 2. DOCUMENTATION (Network Cable): CONTRACTOR shall provide documentation to include test results and as-built Drawings. Network Cable Results: Handwritten results are acceptable provided the test is neat and legible. Copies of test results are not acceptable. Only original signed copies will be acceptable.
 - a. Each cable installed shall undergo complete testing in accordance with TIA/EIA-568-B.1 to guarantee performance to this Standard.
 - b. All required documentation shall be submitted within 30 days at conclusion of the project to OWNER.
 - c. Test Criteria: Pass rate to conform to latest TIA/EIA-568-B.1 Standards that incorporate link performance testing through entire path, including cable, couplers, and jumpers.
 3. ACCEPTANCE: Acceptance of the Data Communications System, by OWNER, shall be based on the results of testing, functionality, and receipt of documentation.
- B. Reports (non-LAN cable): Testing organization shall maintain a written record of observations and tests, report defective materials and workmanship, and retest corrected defective items. Testing organization shall submit written reports to ENGINEER.

END OF SECTION

SECTION 16130

RACEWAYS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Raceways for electrical wiring. Types of raceways in this Section include the following:
 - 1. Liquidtight flexible conduit.
 - 2. Underground plastic utilities duct.
 - 3. Rigid metal conduit.
 - 4. Rigid nonmetallic conduit.
 - 5. Electrical nonmetallic tubing.
 - 6. Conduit bodies.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product data for the following products:
 - a. Surface raceway and fittings.
 - b. Wireway and fittings.
 - c. Conduit.
 - d. Conduit bodies.

1.03 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.
 - 2. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical raceway systems. Provide raceway products and components listed and labeled by UL, ETL, or CSA.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in Work include:

1. Conduit:

- a. Allied Tube.
- b. Carlon.
- c. General Electric Co.
- d. Johns Manville.
- e. Occidental Coatings.
- f. Orangeburg.
- g. Perma-Cote Industries.
- h. Republic Steel.
- i. Robroy Industries.
- j. Steelduct Co.
- k. Triangle Conduit.
- l. Wheatland Tube.
- m. Youngstown Sheet and Tube.

2. Liquidtight Conduit:

- a. Anamet, Inc.
- b. Carlon.
- c. Electric-Flex.
- d. Thomas and Betts.

3. Conduit Bodies:

- a. Adalet-PLM.
- b. American Electric.

- c. Appleton Electric Co.
- d. Carlon.
- e. Crouse-Hinds Division, Cooper Industries, Inc.
- f. Delta Industrial Products.
- g. Killark Electric Mfg. Co.
- h. Kraloy Products Co.
- i. O-Z/Gedney Co.
- j. Perma-Cote Industries.
- k. Robroy Industries.
- l. Spring City Electrical Mfg. Co.

2.02 METAL CONDUIT AND TUBING

- A. Rigid Metal Conduit: Rigid Aluminum Conduit.
- B. Electrical Metallic Tubing and Fittings: ANSI C 80.3.
- C. Liquidtight Flexible Metal Conduit and Fittings: UL 360. Fittings shall be specifically approved for use with this raceway.

2.03 NONMETALLIC CONDUIT AND DUCTS

- A. Rigid Nonmetallic Conduit (RNC): NEMA TC 2 and UL 651, Schedule 80 PVC.
- B. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

2.04 CONDUIT BODIES

- A. Provide matching gasketed covers secured with corrosion-resistant screws. Use cast covers in NEMA 4 areas and stamped steel covers in NEMA 1 and 12 areas. Use nonmetallic covers in NEMA 4X areas and threaded, ground joint covers in NEMA 7 and NEMA 9 areas.
- B. Metallic Conduit and Tubing: Use metallic conduit bodies as follows:
 - 1. Rigid Metal Conduit: Use cast or malleable iron conduit bodies with zinc electroplating, aluminum enamel or lacquer finish, and threaded hubs.

2. Electrical Metallic Tubing: Use cast or malleable iron conduit bodies with zinc electroplating, aluminum enamel or lacquer finish, and compression type or setscrew connectors.
3. Nonmetallic Conduit and Tubing: Use nonmetallic conduit bodies conforming to UL 514 B.
4. NEMA 7 and NEMA 9 Areas: Use materials conforming to UL standards for the area.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 16410

CIRCUIT AND MOTOR DISCONNECTS

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product data for each type of product specified.
- B. Operation and Maintenance Manuals: Submit in accordance with requirements of Sections 01600 and 13410, operation and maintenance manuals for items included under this Section, including circuits and motor disconnects.

1.02 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. Electrical Component Standards: Provide components which are listed and labeled by UL. Comply with UL Standard 98 and NEMA Standard KS 1.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Eaton.
 - 2. General Electric Co.
 - 3. Siemens, Inc.
 - 4. Square D Company.

2.02 CIRCUIT AND MOTOR DISCONNECT SWITCHES

- A. Provide NEMA 4X stainless steel enclosure to match the rating of the area in which switch is installed. For motor and motor starter disconnects through 100 horsepower, provide units with horsepower ratings suitable to loads. For motor and motor starter disconnects above 100 horsepower, clearly label switch, "DO NOT OPEN UNDER LOAD."

- B. Circuit Breaker Switches: Where individual circuit breakers are required, provide factory-assembled, molded-case circuit breakers with permanent instantaneous magnetic and thermal trips in each pole, and with fault-current limiting protection, ampere ratings as indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Provide push-to-trip feature for testing and exercising circuit breaker trip mechanism. Construct breakers for mounting and operating in any physical position and in an ambient temperature of 40 degrees C. Provide with AL/CU-rated mechanical screw type removable connector lugs.
- C. Non-fusible Disconnects: (Heavy-duty) switches of classes and current ratings as indicated.
- D. Switches for Classified (Hazardous) Locations: Heavy-duty switches with UL labels and listings for hazardous location classifications in which installed.

2.03 ACCESSORIES

- A. Special Enclosure Material: Provide special enclosure material as follows for switches indicated:
 - 1. Stainless Steel for NEMA 4X switches.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 16440

PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Lighting panelboards.

1.02 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:

1. Manufacturer's product data on panelboards and enclosures.

1.03 QUALITY ASSURANCE

A. Codes and Standards:

1. UL Compliance: Comply with applicable requirements of UL 67, "Electric Panelboards," and UL's 50, 869, 486A, 486B, and 1053 pertaining to panelboards, accessories, and enclosures. Provide panelboard units which are UL listed and labeled.
2. NEMA Compliance: Comply with NEMA Standards Pub/No. 250, "Enclosures for Electrical Equipment (1,000 Volts Maximum)," Pub/No. PB 1, "Panelboards," and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less."
3. Federal Specification Compliance: Comply with FS W-P-115, "Power Distribution Panel," pertaining to panelboards and accessories.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:

1. Eaton
2. General Electric Company.

3. Siemens, Inc.
4. Square D Company.

2.02 PANELBOARDS

- A. Except as otherwise indicated, provide panelboards, enclosures, and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; with design and construction in accordance with published product information. Equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL, and established industry standards for those applications indicated.
- B. Lighting Panelboards: Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, and types shown; with anti-turn solderless pressure type lug connectors approved for use with copper conductors. Construct unit for connecting feeders at top of panel; equip with copper bus bars, full-sized neutral bar with bolt-in type heavy-duty, quick-make quick-break, single pole circuit breakers, and toggle handles that indicate when tripped. Provide suitable lugs on neutral bus for each outgoing feeder required and provide bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate and match properly with panelboards. Panelboards and circuit breakers shall be braced for 10,000 rms symmetrical amperes fault current unless otherwise indicated.
- C. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code gauge, minimum 16-gauge thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with adjustable trim clamps and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed piano door hinges and door swings as indicated. Equip with interior circuit directory frame and card with clear plastic covering. Provide baked gray enamel finish over a rust-inhibitor coating. Design enclosures for recessed or surface mounting as indicated. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards to be enclosed.
- D. Molded-Case Circuit Breakers: Provide factory assembled, molded-case circuit breakers of frame sizes, characteristics, and ratings, including rms symmetrical interrupting ratings indicated. Select breakers with permanent thermal and instantaneous magnetic trip, and with fault-current limiting protection, ampere ratings as indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make quick-break action and positive handle trip indication. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40 degrees C. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated.
- E. Ground Fault Protected Breakers: Provide UL Class A protected GFI breakers with 6 mA for personnel protection, and for general-purpose receptacles. For breakers dedicated to equipment (sump pumps, heat trace, etc.), provide breaker with 30 mA equipment protection.

- F. Accessories: Provide panelboard accessories and devices including, but not necessarily limited to, ground-fault protection units or circuit breaker locking hardware as indicated.
- G. Spares: In each panelboard provide 8 installed, single pole, 20A spare circuit breakers unless otherwise indicated.

PART 3 - EXECUTION

3.01 INSTALLATION OF PANELBOARDS

- A. Type out panelboard's circuit directory card upon completion of installation Work.

END OF SECTION

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SECTION 16485

VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, materials, equipment and incidentals required, and install, place in operation and field test variable frequency drive(s) (VFD's).
- B. The VFD manufacturer shall have overall responsibility for the drives. All drives shall be supplied by one manufacturer. The VFD shall be manufactured within the United States of America to alleviate concerns of future serviceability and parts availability.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Pumps, General
- B. Division 13 - Instrumentation

1.03 QUALITY ASSURANCE

- A. The entire VFD system as described in section 2.01B shall be factory assembled and system tested by the VFD manufacturer to assure a properly coordinated system.
- B. Codes: Provide equipment in full accordance with the latest applicable rules, regulations, and standards of:
 - 1. Local Laws and Ordinances.
 - 2. State and Federal Laws.
 - 3. National Electric Code (NEC).
 - 4. Underwriters Laboratories (UL).
 - 5. American National Standards Institute (ANSI).
 - 6. National Electrical Manufacturers Association (NEMA).
 - 7. Institute of Electrical and Electronics Engineers (IEEE).
- C. The complete drive system shall be UL listed.
- D. Acceptable Manufacturers:
 - 1. Yakasawa by Icon Technologies

1.04 SUBMITTALS

- A. Submittals shall conform in all respects to Section 01340 SHOP DRAWINGS, WORKING DRAWINGS, AND SAMPLES.
- B. Submittals shall be custom prepared by the VFD manufacturer for this specific application.
- C. Submittal information shall include, but not be limited to:
 - 1. Equipment dimensions, including stub-up locations, shipping splits and shipping weights.
 - 2. Catalog cuts of major components.
 - 3. Spare parts list, per Paragraph 3.03.
 - 4. Certifications, including:
 - a. Warranty, per section 1.05.
 - b. Efficiencies, per section 2.02.A.1.

1.05 WARRANTY

- A. All equipment furnished under this section shall be warranted for on site parts and labor by the contractor and the equipment manufacturers for a period of five (5) years after substantial completion.

PART 2 - PRODUCTS

2.01 Material and Equipment

- A. Any modifications to a standard product required to meet this specification shall be performed by the VFD manufacturer only. Distributor or system integrator changes to the VFD manufacturer's product are specifically disallowed.
- B. The VFD system shall consist of a power factor correction / harmonic filter unit, input rectifier-grade phase-shifting transformer, 18 pulse converter section, output inverter and control logic section, harmonic filtering unit, 3% input line reactor, and 3% output filter and internal bypass where shown on the drawings. All components listed including power factor correction / harmonic filter shall be integral to the VFD lineup, factory wired and tested as a complete system. The entire VFD system shall meet the requirements of NEC article 409 and IEEE 508A for fault current withstand ratings as indicated on the project electrical drawings.
- C. Input circuit breaker, interlocked with the enclosure door, with through-the-door handle to provide positive disconnect of incoming AC power and shall be capable of being locked in the open position.

- D. VFD system shall maintain a 0.95 minimum true power factor throughout the entire speed range.

2.02 VARIABLE FREQUENCY DRIVES

A. Ratings

1. The drive system shall be 96% efficient at full load and full speed and 95.5% efficient at 51% load and 80% speed. Losses to be utilized in drive system efficiency calculation shall include input transformer, harmonic filter and power factor correction if applicable, VFD converter and output filter if applicable. Auxiliary controls, such as internal VFD control boards, cooling fans or pumps, shall be included in all loss calculations.
2. Rated Input Power: 460 Volts 60 Hz, +10%, -5% at rated load, 3-phase.
 - a. Voltage Dip Ride-Through: VFD shall be capable of sustaining continued operation with a 40% dip in nominal line voltage. Output speed may decline only if current limit rating of VFD is exceeded.
 - b. Power Loss Ride-through: VFD shall be capable of a minimum 3-cycle power loss ride-through without fault activation.
3. Output Power: As required by motors supplied.
4. Ambient Temperature Range: 0 to 40°C.
5. Elevation: Up to 3300 feet (1000 meters) above MSL without derating.
6. Atmosphere: Non-condensing relative humidity to 95%.
7. AC Line Frequency Variation: +/- 3 Hertz.
8. Power Unit Rating Basis: 110% rated current continuous, 150% rated current for one minute, at rated temperature. If the power unit rating of the VFD does not meet the above requirements, provide VFD with one standard size larger than the nameplate motor horsepower.

B. Construction

1. The controller shall produce an adjustable AC voltage/frequency output. It shall have an output voltage regulator to maintain correct output V/Hz ratio despite incoming voltage variations.
2. The controller shall have a continuous output current rating of 100% of motor nameplate current.
3. The inverter output shall be generated by IGBTs. Pulse Width Modulation strategy will be of the space vector type implemented to generate a sine-coded output

voltage. The VFD shall not induce excessive power losses in the motor. The worst-case RMS motor line current measured at rated speed, torque and voltage shall not exceed 1.05 times the rated RMS motor current for pure sine wave operation. The inverters shall be able to sustain 1600-volt surges.

4. The controller(s) shall be suitable for use with any standard NEMA-B squirrel-cage induction motor(s) having a 1.15 Service Factor or with existing standard NEMA-B squirrel-cage induction motor(s) with nameplate data as shown on the plans. Provide drives with dV/dT output filters manufactured by Trans-Coil type KLC. At any time in the future, it shall be possible to substitute any standard motor (equivalent horsepower, voltage and RPM) in the field.
5. The control logic section shall be fully digital and not require analog adjustment pots or fixed selector resistors. A power failure will not necessitate a reload of any drive parameter or configuration.
6. Minimum Starting Speed: When called to operate, the VFD shall ramp to a minimum speed. The minimum speed shall be adjustable but initially set at 60% of maximum speed. The 4-20 mA speed signal from the PLC and potentiometer on the front of the drive shall modulate the signal between the minimum speed setpoint and the maximum output speed of the drive; i.e., at the 4 mA signal, the VFD shall run at the minimum speed. At the 20 mA signal, the VFD shall run at full speed. The potentiometer shall also adjust speed between the minimum speed setpoint and the maximum running speed. Below the minimum speed setpoint, the potentiometer shall have no effect.
8. All 18 pulse VFD's shall be provided with 3% line and load reactors.

C. Basic Features

1. The door of each power unit shall include: a keypad with a manual speed device, "HAND / OFF / REMOTE" mode selector switch, "POWER ON" light, "VFD FAIL" light, VFD "RUNNING" light, fault reset pushbutton, "MOTOR OVER TEMPERATURE" light, "MOTOR HEATER ON" light, "ENCLOSURE OVER TEMPERATURE" light, "DRIVE LOCKOUT" light, CONTROL POWER ON light, START and STOP pushbuttons and a TEST / NORMAL selector switch. All lights shall be LED type.
2. The VFD shall include a customer selectable automatic restart feature. When enabled, the VFD shall automatically attempt to restart after a trip condition resulting from instantaneous overcurrent, overvoltage, out of saturation or overload. For safety, the drive shall shut down and require manual reset and restart if the automatic reset/restart function (programmable for up to 3 attempts) is not successful within a customer programmable time period. Auto-Restart shall be programmable to allow for individual fault selection.
3. A door-mounted membrane keypad with integral 2-line minimum, 24-character LCD display shall be furnished, capable of controlling the VFD and setting drive parameters. The keypad shall include the following features:

- a. The digital display must present all diagnostic message and parameter values in English engineering units when accessed, without the use of codes.
- b. The digital keypad shall allow the operator to enter exact numerical settings in English engineering units. A user menu written in plain English (rather than codes) shall be provided in software in nonvolatile memory as a guide to parameter setting and resettable in the field through the keypad. Multiple levels of password security shall be available to protect drive parameters from unauthorized personnel. The drive set up parameters must be able to be transferred to new boards to reprogram spare boards.
- c. The following digital door-mounted keypad indications may be selectively displayed:
 - i. Speed demand in percent.
 - ii. Output current in amperes.
 - iii. Output Frequency in hertz.
 - iv. Input voltage.
 - v. Output voltage.
 - vi. Total 3-phase KW.
 - vii. Kilowatt hour meter
 - viii. Elapsed time running meter.
 - ix. RPM.
 - x. DC bus voltage.
- d. VFD's shall have the capability of communicating all information via a RJ-45 Ethernet port with a Rockwell (Allen-Bradley) PLC for the reclaimed water side. VFD parameters, fault log and diagnostic log shall be downloadable via a RJ-45 Ethernet port.

4. Refer to the VFD wiring diagram in the drawings for remote signals and alarms.

D. Enclosure

- 1. All VFD components shall be factory mounted and wired on a dead front, grounded, NEMA-12 Gasketed enclosure. If a free-standing enclosure is provided, it shall be suitable for mounting on a concrete housekeeping pad.

E. Protective Features and Circuits: The controller shall include the following alarms and protective features:

1. Instantaneous overcurrent and overvoltage trip.
2. Undervoltage and power loss protection.
3. Power unit overtemperature alarm and protection. Upon sensing an overtemperature overtemperature condition, the VFD is to automatically trip.
4. Electronic motor inverse time overload protection.
5. Responsive action to motor winding temperature detectors or thermostatic switches. A dry contact (NC) input to the VFD is required.
6. When power is restored after a complete power outage, the VFD shall be capable of catching the motor while it is still spinning and restoring it to proper operating speed without the use of an encoder.
7. The VFD shall be protected from damage due to the following, without requiring an output contactor:
 - a. Three-phase short circuit on VFD output terminals.
 - b. Loss of input power due to opening of VFD input disconnecting device or utility power failure during VFD operation.
 - c. Loss of one (1) phase of input power.
8. The VFD shall continue to operate at a reduced capacity under a single-phase fault condition.
9. The VFD shall be able to withstand the following fault conditions without damage to the power circuit components:
 - a. Failure to connect a motor to the VFD output.
 - b. VFD output open circuit that may occur during operation.
 - c. VFD output short circuit that may occur during operation.
10. Three phase lightning and surge protection across the line input at each VFD. Lea Dynatec TVSS #GB-100.
11. Provide submersible pump relay capable of monitoring submersible pump moisture and thermal switches. Fault shall shut down VFD.

F. Parameter Settings

1. The following system configuring settings shall be provided and field adjustable, without exception, through the keypad/display unit. Except for Motor Nameplate Data, all parameters must be adjustable while the processor is on-line and the drive is running.

- a. Motor Nameplate Data.
 - i. Motor frequency.
 - ii. Number of poles.
 - iii. Full load speed.
 - iv. Motor volts.
 - v. Motor full load amps.
 - vi. Motor HP.
 - vii. Current limit, max.
- b. VFD Configuration Parameters.
 - i. Independent accelerate/decelerate rates.
 - ii. Max/Min speed (frequency)
 - iii. Catch-a spinning load selection.
 - iv. No load boost.
 - v. Full load boost.
 - vi. Volts/Hertz ratio.
 - vii. Overspeed trip.
 - viii. Overload trip curve selection.
 - ix. Overload trip time selection.
- c. Automatic VFD Control.
 - i. PID utilizing an internal or external setpoint.
 - ii. Three selectable critical speed avoidance bands with programmable bandwidths.
 - iii. Auto start functions: On/Off, Delay On/Off. Operable from a 4-20mA signal or from the PID output, command, or feedback signal.
 - iv. Speed Profile: Programmable entry and exit points.
 - v. Programmable loss of signal control: Stop, maintain last speed, or default to preselected setpoint.

2. All drive setting adjustments and operation parameters shall be stored in a parameter log which lists allowable maximum and minimum points as well as the present set values. This parameter log shall be accessible via a RJ-45 Ethernet port capable of communicating with a Quantum PLC and a Siemens PLC as applicable as well as on the keypad display.

G. Input/Output Features

1. Two programmable analog inputs: VFD speed in, spare.
2. Three programmable analog outputs: VFD speed output, Drive (output) current in Amps, spare.
3. Two programmable digital inputs: Run, spare.
4. Ten programmable digital outputs: VFD fault, VFD running, VFD in remote, 6 spare.
5. One Pot input (three wire control, +10 V, wiper and common).
6. System Program providing built-in drive control or application specific configuration capability.
7. RJ-45 Ethernet port capable of communicating with a Quantum PLC and a Siemens PLC for all communications on the drive.

H. Diagnostic Features and Fault Handling

1. The VFD shall include a comprehensive microprocessor based digital diagnostic system that monitors its own control functions and displays faults and operating conditions.
2. A "Fault Log" shall be accessible via a RJ-45 Ethernet link capable of communicating with a Quantum PLC or a Siemens PLC as applicable as well as line-by-line on the keypad display. The "FAULT LOG" shall record, store, display and output to a serial port upon demand, the following for the 64 most recent events:
 - a. Date and time of day.
 - b. Type of fault.
 - c. All faults and events shall be stored and displayed in English, not fault codes.
3. A "HISTORIC LOG" shall record, store, and output via a RJ-45 Ethernet link port capable of communicating with a Quantum PLC or a Siemens PLC as applicable upon demand, the following selectable control variables at 1 msec. intervals for the 58 intervals immediately preceding and the 20 intervals immediately following a fault trip:

- a. Torque demand.
- b. Torque command.
- c. Torque feedback.
- d. Torque error.
- e. Torque maximum.
- f. Current demand.
- g. Peak current.
- h. Motor current.
- i. DC bus voltage.
- j. Line voltage.
- k. Velocity demand.
- l. Velocity reference.
- m. PI min/max limit.
- n. Boost.
- o. VFD mode (Auto/Manual).

PART 3 - EXECUTION

3.01 FACTORY TESTING

- A. The VFD manufacturer shall provide as a minimum, the following quality assurance steps within his factory:
 - 1. Incoming inspection of components and raw materials based on strategic supplier base and experience. Sampling plans based on MIL STD 105E.
 - 2. MIL STD 45662 calibration system.
 - 3. All products subject to 100% testing and final inspection; no sampling plans permitted.

3.02 PRE-DELIVERY TESTING COORDINATION

- A. One VFD unit of each specified type and application shall be shipped to the pump manufacturer's test facility for complete operational testing. The VFD Manufacturer shall

provide a qualified representative at the pump Manufacturer's test facility during testing. All costs incurred by the VFD Manufacturer to meet this requirement shall be included in the bid.

- B. Certified test reports shall be submitted to the ENGINEER before the equipment is shipped to the project site.

3.03 STARTUP AND TRAINING

- A. VFD manufacturer shall provide the services of a factory technician for startup assistance and training. Verification of VFD input harmonic voltage and current distortion limits specified must be verified as part of final startup and acceptance. If harmonic distortion requirements are not met, it is the responsibility of the VFD supplier to meet the specification at the supplier's expense. A recording type Fluke 41 or equivalent harmonic analyzer displaying individual and total harmonic currents and voltages must be utilized.
- B. A 10% payment retainage will be released upon field test verification of harmonic specification requirements and final acceptance.

3.04 SPARE PARTS

- A. The following spare parts shall be furnished:
 - 1. Three of each type of fuse rated 460V or less.
 - 2. Two of each type of converter power semiconductor.
 - 3. Two of each type of inverter power semiconductor.
 - 4. One of each type of type control printed circuit board and gate firing boards.
 - 5. Two keypad assembly.
 - 6. Contractor shall submit list of recommended spare parts for Owner to choose from.

3.05 FIELD QUALITY CONTROL

- A. Functional Test:
 - 1. Conduct on each VFD.
 - 2. Inspect controller for electrical supply termination connections, inter-connections, proper installation, and quiet operation.
 - 3. Vibration Test: Complete assembly, consisting of motor, load, and flexible shafting, connected and in normal operation, shall not develop amplitudes of vibration exceeding limits recommended by current edition of Hydraulic Institute Standards. Where pumps and motors are separated by intermediate flexible shafting, measure vibration both at top motor bearing and at two points on top pump bearing, 90 degrees apart.

4. Record test data for report.
- B. Performance Test:
1. Conduct on each VFD.
 2. Perform under actual or approved simulated operating conditions.
 3. Test for continuous 48-hour period without malfunction.
 4. Demonstrate performance by operating the continuous period while varying the application load, as the input conditions allow, in order to verify system performance.
 5. Record test data for report.

END OF SECTION

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SECTION 16510

LIGHTING FIXTURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Types of lighting fixtures, including:
 - 1. LED
- B. Applications for lighting fixtures required for this Project include:
 - 1. Interior lighting.
 - 2. Emergency lighting.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 01340, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
 - 1. Product Data: Submit manufacturer's product data and installation instructions on each type lighting fixture and component. Assemble in booklet form with separate sheet for each fixture, assembled in "luminaire type" alphabetical or numerical order, with proposed fixture and accessories clearly indicated on each sheet. Indicate voltage, bulb type, and wattage.
 - 2. Illumination Data: Provide isofootcandle (isolux) plot diagram of footcandles on horizontal pavement surface which shows values of illuminance projected from indicated fixture heights for roadway and parking area lighting.
- B. Operation and Maintenance Manuals: submit in accordance with Section 01600, operation and maintenance manuals for items included under this Section. Include maintenance data and parts list for each lighting fixture and accessory, and troubleshooting maintenance guide

1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of equipment, of types and sizes required, and whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:

1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Pub/No. LE 2 pertaining lighting equipment.
2. IES Compliance: Comply with IES RP-8, 19, 20, and PB-15 pertaining to exterior, parking, and roadway lighting practices and fixtures.
3. UL Compliance: Comply with requirements of UL standards, including Standards 486A and B, pertaining to lighting fixtures. Provide lighting fixtures and components which are UL listed and labeled.
4. NFPA Compliance: Comply with applicable requirements of NFPA 78, "Lightning Protection Code," pertaining to installation of exterior lighting fixtures.
5. CBM Labels: Provide fluorescent lamp ballasts which comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 1. Lighting Fixtures:
 - a. See Luminaire Schedules on Drawings.

2.02 INTERIOR LIGHTING FIXTURES

- A. Provide lighting fixtures of sizes, types, and ratings indicated on Luminaire Schedule on Drawings, complete with, but not limited to, housings, energy-efficient lamps, lamp holders, reflectors, energy-efficient ballasts, starters, and wiring. Ship fixtures factory assembled with components required for a complete installation.

PART 3 - EXECUTION

3.01 INSTALLATION OF INTERIOR LIGHTING FIXTURES

- A. Install interior lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation," NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements. Field locate fixtures to avoid conflicts with equipment, pipework, etc.

END OF SECTION

ADDITION TECHNICAL INFORMATION

Donax Water Reclamation Facility
Post Hurricane Ian Repairs & Hardening

Wastewater Collection System SCADA Control Room Improvements
Renderings and Color Charts

Donax
Post Ian Improvements – SCADA Room



Renderings – Overhead View



Donax
Post Ian Improvements – SCADA Room



Renderings – Elevation Views



Donax
Post Ian Improvements – SCADA Room



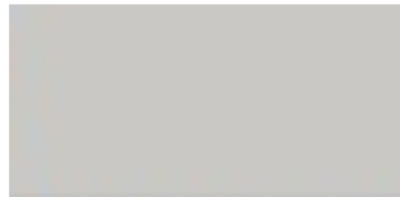
Paint - Walls
Sherwin Williams
SW7029 Agreeable Gray



Tile - Backsplash
Crossville Tile
Color by Numbers, 1812 Overture WT18



Countertop – SS-1
Livingstone
Rain Dance L714



Grout - Tile
Custom Building Products
544 Rolling Fog



Cabinet – PL-1
Wilsonart
Harrison Elm 8262



Flooring – LVT-1
Tarkett
Contour Stone Rialto 0631

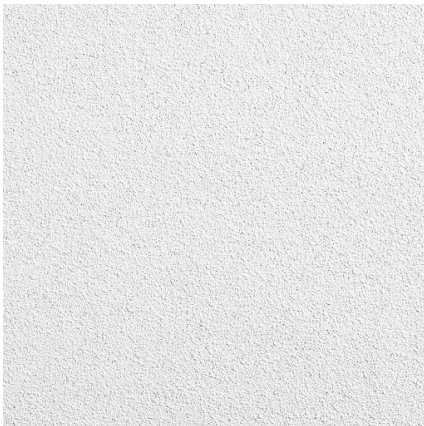
Interior Finish Board



Donax
Post Ian Improvements – SCADA Room



Paint - Doors
Sherwin Williams
SW7674 Peppercorn



Ceiling – ACT-1
Armstrong
Ultima



Rubber Base – RB-1
Tarkett
TA4 Gateway

Interior Finish Board

